A MANUAL

OF

MATERIA MEDICA AND THERAPEUTICS.

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MATERIA MEDICA AND THERAPEUTICS;

INCLUDING

THE PREPARATIONS OF THE PHARMACOPŒIAS

OF

LONDON, EDINBURGH, AND DUBLIN

WITH MANY NEW MEDICINES.

BY

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MEDICINA LITERIS

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PREFACE TO THE SECOND EDITION.

A LARGE edition of this work having been sold and a new one having for some time been required, justify the intelligent Publisher in his opinion that it was wanted. The Author having also thought that the Student in Materia Medica required something systematic to study, in which the information, brought up to the Science of the present time, should be full, and yet as much condensed, as was compatible with the avoidance of being superficial,—he has endeavoured to carry out these objects in the present work. But, his leisure time, previous to, during, and even subsequent to the Great Exhibition of 1851, was so much taken up, that he was unable to devote the necessary time to the revision of the Formulæ of the New Editions of the London and Dublin Pharmacopœias. He has therefore been much indebted to his friend, Mr. F. W. Headland, Author of the Fothergillian Prize "Essay on the Action of Medicines," for most valuable assistance throughout this Edition, especially in making the Preparations correspond with the New Editions of the London and Dublin Pharmacopœias, the latter published in the year 1850 and the former in 1851; also in revising many of the Chemical Formulæ, for the Tabular arrangement of the Mineral Materia Medica, pp. 238 to 259, and for that of the Characters of the Natural Families

of Plants, pp. 275 to 281; also for his Process of making Aconitina, and for new articles on the Cinchona Alkaloids, on Chloroform, and on Cod-Liver Oil, of which two latter subjects there was no account in the first Edition.

The work has become more bulky than was wished, but this is hardly to be avoided, from the great number of distinct substances in the three Pharmacopœias, with their several preparations, each requiring a number of distinct facts to be related respecting it, and without curtailment. This might in some measure be avoided if the three Colleges would make one Pharmacopœia for one kingdom, or at least reduce their differences to a minimum by retaining such only as might be considered essential. The Author, however, is far from being an advocate for limiting the recognized Materia Medica to too brief a list; as great advantages are often derived from the power of changing one remedy for another of nearly similar properties; and there are few which are exactly alike. It must also be remembered, that the British Schools of Medicine provide Practitioners for nearly all parts of the world, who, if they do not, while students, acquire some general ideas respecting the resources of Materia Medica, seldom do so afterwards. Indeed they usually remain content to depend upon home supplies, instead of making use of the valuable resources often within their reach. As the Author anticipated, some obscurity has been experienced from the attempt to condense the directions for the Preparations of the three Colleges. They have therefore been given separately in this Edition.

As Students are frequently unacquainted with the necessary preliminary sciences when they begin the study of Materia Medica, the Author has introduced a notice of some of the laws and nomenclature of Chemistry, under the head of Pharmaceutical Chemistry, and some account of the Parts and Products of Plants, with their Physiology,

Classification and Medical properties, as connected with Structure. But instead of the full characters of Natural families which were given in the former edition, a tabular arrangement has been introduced. In the description of the Physical and Chemical and other characters of the Drugs, or of Materia Medica proper, he continues to adopt the Natural History arrangement as most conducive to accuracy of knowledge. Under each article are given, the Physical and Chemical properties of the inorganic or organic product used; and with the latter the description of the Mineral, Plant, or Animal producing the drug, along with its Preparations, Tests, Actions, Uses and Doses.

But as the ultimate object of the previous accurate and scientific study is the acquirement of a knowledge of the Modes of Action, and of the Uses of these Drugs as Medicines, this is necessarily the most important part of the whole subject. It is to be feared that the Natural History arrangement may sometimes divert attention from this, by separating drugs that are nearly allied in their mode of action; but this even a Physiological arrangement will do, for many medicines act in two or three different ways, and may be made to produce very different and even opposite effects. The Author has therefore, to remedy some of the inconveniences, grouped together at the end of his work all those Remedies which may be used for the same Therapeutical purposes, with some general observations respecting the action and uses of each group of these medicinal agents. He regrets having to confine himself within such narrow limits, which, as he stated in his first edition, would require a volume to itself.

The Author has, in his first edition, referred to the various Authors to whom he had been indebted for information; but among these there was one whom his friends have to deplore as among the departed, and Materia Medica as having lost one of its most zealous and accomplished vota-

ries. The author hopes that he will be joined by others in naming the plant called by the late Dr. Pereira, the Myrospermum of Sonsonate, as Myrospermum Pereiræ, *v.* p. 414. The Author much regrets that his own avocations have prevented his assisting Dr. Alfred Taylor, in completing the last part of the Third Edition of Dr. Pereira's invaluable "Elements of Materia Medica."

In conclusion, the Author must thank the Publisher, as well as the Printers, for the elegant and clear typography, and Mr. Bagg for the skill and taste he has displayed in the wood-cuts.

TABLE OF CONTENTS.

MANUAL

OF

MATERIA MEDICA AND THERAPEUTICS.

"Materia Medica and Therapeutics," being the title of one of the courses of lectures attended by students of medicine, is adopted as that of this Manual, because it treats of the same subjects; that is, it gives an account of the substances and agents which are employed as remedies for the relief or cure of disease. These consist either of material substances or of the general powers of nature. Advantage is also taken, in some measure, and in particular cases, of mental affections and passions.

The subjects divide themselves naturally into two distinct branches.

1. Materia Medica; meaning, correctly, the material substances employed as medicines; although it often includes other means employed with the same object. It treats of their natural characters, sensible properties, chemical qualities, and mode of action as medicines.

2. Therapeutica, from θεραπεύω, *to take care of* the sick, to heal. Therapeutics, in the most comprehensive sense, includes the application of remedies for the prevention or cure of disease. As connected with Materia Medica, it treats of the modes of action and of the effects of medicines as employed for the restoration of healthy action, and the consequent removal of disease. Since a variety of substances are capable of producing the same general effects, though they may differ from each other in minute particulars, they are frequently grouped together, so as to form classes of Medicines. These are convenient for practical purposes, because what is best suited to the peculiarities of a constitution, or to the different stages of any particular case, may by their help be more easily selected; or one remedy may be substituted for another, when the first has begun to lose its effect.

"Materia Medica and Therapeutics hold a middle place between the purely scientific and the strictly practical branches of professional

study. Of the former, Natural Philosophy and Chemistry treat of the properties and intimate relations of all natural substances, as well as of the powers of nature. They form necessary preliminaries for fully understanding any of the natural sciences, and thus become a part of the studies of other professions as well as of medicine. Botany and Comparative Anatomy, treating of the structure and physiology of plants and of animals, as well as of their classification, geographical distribution, and uses to man, are equally essential objects of study to those who wish only to attend to agricultural or to horticultural pursuits, or to improving the breeds of animals. Even Human Anatomy and Physiology are often studied by those who desire only to become acquainted with the internal structure and functions of the body to perfect themselves as painters or as sculptors, or who desire to study the beauty and design displayed in the works of the Creator.

"The strictly practical branches of professional study—of which the principles, however, require also to be scientifically studied—are embraced in the departments of Surgery, Medicine, and Midwifery, which elucidate the nature and treatment of diseases, both external and internal, as well as those peculiar to women and children, and of the process of parturition. To these is superadded Forensic Medicine, a complicated branch of study, as it is connected with every other, and requires a knowledge both of healthy and of diseased structure, as well as of the effects of deleterious agents on the constitution.

"The practical sciences require for their study and practice a complete knowledge not only of their own particular subjects and of the above-mentioned preliminary sciences, but also of the agents and substances, whatever be their nature, which are called Remedies, and which are employed to alleviate or to remove all departures from the healthy state, or what constitutes the disease." *

A complete knowledge of Medicines comprises an acquaintance with their physical and chemical characters, their physiological action, and therapeutical effects. Medicines have been defined to be, all substances which have the power of modifying the actual state of one or more of our organs, and which possess this property independent of their nutritive qualities. Hence they are administered in disease, for the purpose of curing or relieving. M. Barbier gives us a distinctive character of remedies, the property of not being decomposable, nor of being easily transformed into chyle by the action of the stomach. Alimentary substances, on the contrary, are digested, and transformed into chyle. This, however, will not apply to all; for some of the vegetable salts, as the acetates, citrates, and tartrates, are converted into carbonates in passing from the stomach into the excretions; while there are no means of proving whether other substances strictly nutritive, such as fibrin and albumen, are decomposed or not. It is clear that aliments are assimilated to our organs, and become an inte-

* Medical Education,—a Lecture delivered at King's College by the Author. Session 1844-45.

gral part of our bodies; whilst remedies do not contribute in a direct manner to nutrition. It is equally difficult to define remedies as distinct from poisons; for, in fact, many of the same substances act either as remedies or as poisons, according to the quantities in which they are applied to our organs.

Before knowing how and when to prescribe a medicine, its nature ought to be thoroughly understood. A knowledge of medicines, therefore, comprehends an acquaintance with their external character, their sensible properties, and their chemical nature, as well as their modes of preparation. With these, should be included some knowledge of the Natural History of the Animals, Plants, or Minerals which yield them. In order to prescribe them as efficient agents for producing changes in different organs and functions, we must be acquainted with their mode of action on the several tissues and organs, as well in a state of health as in disease,—that is, with both their Physiological action and their Therapeutical effects. With all this must be combined a knowledge of the forms in which they may most fitly be prescribed, the substances with which they may be combined, or with which they are incompatible, the doses in which they must be given, and the cautions which peculiar circumstances may render necessary: all which is embraced in the theory and art of prescribing, together with the rules for the diet and treatment of the sick and convalescent.

It is hardly necessary to state, that, for the purposes of Materia Medica and Therapeutics, so much only of the sciences connected with the above subjects requires to be known as to enable the mode of action and effects of substances, when employed as remedies, to be appreciated. These cannot be fully discussed in this Manual, for they include, in fact, a large portion of the objects of scientific study. Thus, the affections of the mind and the passions are treated of in systems of Mental and of Moral Philosophy. The general powers or forces of nature, such as Heat, Light, Electricity, and Magnetism, as well as the nature and constitution of the Atmosphere and of Water, as also the subject of Climate, are discussed both by the Natural and by the Chemical philosopher.

The material substances commonly called Medicines being necessarily obtained from the Mineral, the Vegetable, and Animal Kingdoms, might be expected to be treated of with the minerals, plants, or animals which yield them, in works of Natural History, that is, of Mineralogy, of Botany, and of Zoology. This, however, is seldom the case, except so far as their external characters are concerned, which require to be observed for the purposes of classification. The internal structure of the plants and animals which yield them are examined by vegetable and comparative anatomists. The composition of *organic* beings and of their products, as well as of mineral substances, is ascertained by the chemist. The mineral kingdom is sometimes distinguished, by the name of *inorganic*, from the vegetable and animal

which differ very conspicuously, in the different parts of each, however constituted or howsoever composed, being *organized*. They are thus calculated to perform particular functions, which are controlled by the vital powers, and form the objects of study for Vegetable and Animal Physiologists.

Though for the study of Materia Medica it is not requisite to master these various sciences, yet as we wish to acquire an accurate knowledge of the nature of medicines, the modes of classification pursued in these several sciences may be adopted as the best means of attaining that object. Indeed, this mode of studying animal, vegetable, and mineral substances may with advantage be considered as an abridged view of their respective sciences, in which the principles and classification are briefly treated of, and the details exemplified by medicinal substances.

The products of the mineral kingdom being inorganic, and also more simple in composition, it becomes desirable to study them first; so that we may proceed from simply observing the external characters and chemical composition of minerals, to consider the complicated structure and functions of organized bodies. Medicines from the mineral kingdom may be arranged either according to their external characters, as in some systems of mineralogy, or according to their chemical composition, as is the case in others, as well as in systems of Chemistry. The latter plan affords numerous advantages, besides enabling the substances which are produced in nature to be arranged together with those which are the result of pharmaceutical operations, as many of these are of a chemical nature.

Before proceeding to treat specifically of individual substances, it might be expected that something should be said of the modes of distinguishing Minerals by their external characters, or of the primitive forms of Crystals and of the laws of Crystallization, or of the several formations of rocks, whether primary, secondary, tertiary, or alluvial, from which different Medicinal substances are obtained.

It might also be expected that notice should be taken of the General Properties of Matter, as the Attraction of Cohesion, which attracts the particles of matter to each other; or of such subjects as the Solidity, Hardness, Specific Gravity, powers of Electricity, and Refraction of bodies, because these require to be noticed in the descriptions of each individual substance. But these subjects are fully treated of in their respective Sciences; and for the purposes of Materia Medica it is only required to make use of the correct Nomenclature, scientific Classification, and other information which these afford.

As it is more natural to attend first to what may be seen and touched, so in the following descriptions, the External, Physical, and Sensible Characters of each substance will be first noticed, and this before proceeding to the Chemical Composition, as this can only be determined by Analysis, which requires that a substance should be *destroyed*.

OPERATIONS OF PHARMACY.

Medicinal substances, as produced by nature, not being usually fit for exhibition as Medicines, require a number of preliminary processes, which are called Operations of Pharmacy.

These relate—1. To the choosing, collection, and preservation of Drugs. 2. Their preparation, to fit them for exhibition as Medicines, including their mixture and combination. For the sake of uniformity, these require to be ordered by authority, and are so in the several Pharmacopœias of London, Edinburgh, and Dublin.

The choosing of Drugs necessarily implies a knowledge of the whole subject, as all the characters both of genuine and of adulterated drugs should be well known before they are selected or purchased, or an attempt is made to prescribe them. For this purpose all the external characters, as colour, smell, taste, form, consistence, comparative weight, fracture, degree of solubility, point of fusion, &c., also their chemical nature and composition, must be noticed, and their purity be ascertained by means of *Chemical Tests.*

The collection of Drugs requires, in addition, that the influence of different Physiological states, both in plants and animals, should be attended to. Hence season, situation, aspect, age, habit, the natural or cultivated states,—are all of importance.

The Preservation of Drugs requires attention to the best methods of drying both mineral and organic substances, as well as to the necessity of protecting many of them from the influence of air, of moisture, and of light. To protect them from the latter, black or green bottles are ordered for particular preparations.

Drugs require to be weighed, both for Pharmaceutical preparations and in dispensing. Troy, called also Apothecaries' Weight, is generally employed for these purposes, and is divided as below, each weight being denoted by its sign.

One	Pound,	℔ i.	=	12 Ounces,	℥ xij	=	5760 grs.
,,	Ounce,	℥ i.	=	8 Drachms,	ʒ viij	=	480 ,,
,,	Drachm,	ʒ i.	=	3 Scruples,	℈ iij	=	60 ,,
,,	Scruple,	℈ i.	=	20 Grains,	gr. xx	=	20 ,,
,,	Grain,	gr. i.					

The Avoirdupois weight is commonly used in commerce, and has been adopted in a modified form in the last edition of the Dublin Pharmacopœia.

The introduction of a new standard Pound which necessitates decimal numbers in the subdivisions, serves to complicate and confuse

this weight. It is as follows, the grains being the same as in Troy weight.

One Pound,	= 16	Ounces,	= 7000	grs.
„ Ounce,	= 8	Drachms,	= 437·5	„
„ Drachm,	= 3	Scruples,	= 54·7	„
„ Scruple,	= 18·22	Grains,	= 18·22	„

One pound, or twelve ounces, Troy, equals thirteen ounces and seventy-three grains of the Dublin Avoirdupois weight.

Liquids used formerly to be weighed, but as it is much more convenient to measure them, this method is now generally adopted. The Wine Measure was formerly employed; but the Imperial Gallon is now used, and is thus divided and distinguished :—

IMPERIAL MEASURE ADOPTED IN THE THREE PHARMACOPŒIAS.

				Minims.	Wine Measure in former Pharmacopœia.
One Gallon,	C i.	= 8 Pints,	O viij.	= 76800	61440 = O viij.
„ Pint,	O i.	= 20 Fluidounces,	f℥ xx.	= 9600	7680 = f℥ xvj.
„ Fluidounce,	f℥ i.	= 8 Fluidrachms,	fʒ viij.	= 480	480 = fʒ viij.
„ Fluidrachm,	fʒ i.	= 60 Minims,	♏ lx.	= 60	60 = ♏ lx.
Minim,	♏				

The Imperial Gallon and Pint evidently contain much more than the Wine Measure, in the proportion of about 5 to 4; but the College, by dividing the Pint into f℥xx, instead of into f℥xvi, obtain nearly the same quantities for the ounce, drachm, and minim. (Phillips' Transl. of the London Pharmacopœia.) An Imperial ounce is equal to 7 drachms and 41 minims of the wine measure.

It must be remembered that a minim does not weigh exactly a grain. The imperial minim weighs ·91 grains, and the fluid drachm 54·7 grains.

Bodies occupying the same space are, however, well known to differ much in weight, as, for instance, Lead and Cork, in consequence of the former containing more matter in the same space than the latter; or, in other words, Lead has a greater *density* than Cork. Bodies are, therefore, weighed under two points of view: first with respect to their absolute weights, and second, with reference to that which is peculiar to each *species*, and is hence called *Specific Gravity*. This refers to the comparative weights of different bodies occupying the same space and referred to a common standard. As the quantity of matter within the same space differs very much according as it is more or less expanded by heat, so the Sp. Gr. of bodies is always referred to one temperature, that is, 60°; but the London College mentions 62° of Fahr. The quantity of a medicinal substance, as of an acid, an alkali, or a spirit, may, moreover, vary very much in the same bulk according as it is more or less diluted with water. And as this fluid will be either lighter or heavier than water, its solution will thus be heavier or lighter, exactly according to the degree of dilution.

The strength, therefore, which is the same thing as the Sp. Gr., requires to be ascertained both for Pharmaceutic and for Medicinal purposes. Water is, for convenience, taken as the standard to which the comparative weights of other bodies are referred; but its Sp. Gr., though usually reckoned as 1, is by some taken at 1000, to avoid fractional parts.

The Sp. Gr. of a liquid may easily be ascertained by weighing it in a bottle which holds exactly 1000 grains of water at 60°. Solids are weighed first in air, and then, when suspended by a hair, in water. In this case, they displace a quantity of water equal to their own bulk, and weigh less than in air, because they are supported by the surrounding water with a force equal to the weight of water which has been displaced. So that the loss in the weight will denote the weight of an equal bulk of water. This then is the rule: find the difference between the weight of the body in air, and when weighed in water; take this difference to divide the weight of the body in air, and the quotient will be the specific gravity. The Sp. Gr. of aëriform bodies is ascertained by weighing certain measured quantities when passed into a vessel exhausted of air, and of which the weight has been previously ascertained. The different gases vary very much in their Sp. Gr., but they are all referred to Atmospheric air as a standard. By careful experiment, it has been found that 100 cubic inches of air weigh 31·0177 grains at 60° of Temperature and 30 inches of Barometrical pressure.

Professor Daniell has given the following table of the Sp. Gr. of the lightest gas, of air, of steam, and of water:

Cubic inches.		Weights, Grains.	Sp. Gr. Air 1.	Sp. Gr. Water 1.
Hydrogen,	100	2·136	0·0694	0·0000846
Air,	100	31·000	1·0000	0·0012277
Steam,	100	19·220	0·6240	0·0007611
Water,	100	25250·000	814·0000	1·0000000

MECHANICAL OPERATIONS OF PHARMACY.

Before Drugs can be exhibited as Medicines, they require to undergo a variety of processes, some of a Mechanical, others of a Chemical nature. Of the first kind some are intended merely to effect Mechanical Division. This is useful in two ways, first in assisting the chemical action of bodies upon each other, and secondly, in rendering them more easy of administration as Medicines. Some substances must be subjected to preliminary operations, as Cleaning, Cutting, Bruising, Grating, Rasping, Filing; or they may be powdered in mortars of wood, iron, wedgwood, glass, &c.; or ground in mills or

between rollers. The different modes are sometimes distinguished by distinct names:

Pulverization by	Contusion,	as Pounding of tough substances.
,,	Trituration,	Rubbing to a fine powder.
,,	Grinding,	as in Mills and between Rollers.
,,	Friction,	as with a grater, file, or rubbing.
,,	Porphyrization,	on a Slab with a muller.
Mediate Pulverization,		when substances are added to assist the process, and are afterwards washed out.
Levigation . . .		Fine Trituration with water, or any fluid in which the solid is not soluble.
Granulation . . .		when melted metal is agitated till it cools, or is shaken in a box, or poured from a height into cold water.

As the finest powders prepared by the above means always contain some coarse particles, so methods are adopted by which the particles of bodies may be mechanically separated. Thus, Pharmaceutists adopt—

To separate solids from solids,

Elutriation, or washing.	The fine particles, being suspended, are poured off from the coarser, and are then allowed to settle.
Sifting, as with Sieves,	Sieves may be simple or compound, of wire, perforated zinc, hair, or gauze; or the fine particles may be dusted through bags.

To separate fluids from solids,

Decanting:	Deposition,	when performed for the sake of the solid.
,,	Defæcation	,, ,, ,, of the fluid.

Or the fluid may be sucked off with a sucking-tube, or removed with a syphon.

Filtration . . .	with Funnels and Filters; woollen or paper filters, or powdered glass, or Charcoal and sand, may be used.
Expression . . .	for separating vegetable juices, or pulp of fruits, oils, &c., from ligneous fibre, &c.
Clarification, or Despumation,	by adding different substances, as Albumen, or the white of egg, or isinglass, when a scum rises to the surface, or falls to the bottom, carrying impurities with it.

Fluids may be separated from fluids, when there is no affinity between them, and they are of different specific gravities; as by decanting, skimming-off, the use of the Separatory, or by a Syringe, &c.

Several preparations fitted for exhibition as Medicines are prepared by the above mechanical processes with the addition of mixing, such as Powders, Pills, Confections, Electuaries, Mellita, Mixtures, Cerates, Ointments, Plasters.

CHEMICAL OPERATIONS OF PHARMACY.

Mechanical operations are concerned either in altering the state of aggregation of a substance, or in separating mechanically some bodies from others; but in this second class of processes we avail ourselves of chemical laws to effect an actual change in the state of a body, so that it may be presented to us in a different form, condition, or state of combination. Those operations only will now be considered which involve simply a change of condition, and not of chemical composition. They are, Fusion, Solution, Vaporization, Precipitation, and Crystallization. In most cases the agency of *Heat* is concerned.

Temperature is measured by Fahrenheit's Thermometer, of which the Freezing Point is 32° and the Boiling Point 212°. A gentle Heat means any degree between 90° and 100°. A Water-Bath signifies an apparatus for heating by boiling water or by steam; a Sand-Bath, one in which a vessel is placed and warmed by the gradual heating of sand.

Fusion, or melting produced by increasing temperature, is practised with metals, wax, &c. Bodies first dilate, and then, if not decomposed, they melt, and each always at the same temperature. No further increase of temperature then takes place, as all subsequent additions of caloric become latent. Fusion may be effected in metallic vessels, in the open air, as in furnaces, or in crucibles: the London College mentions Hessian and Cornish ones. In some cases, fluxes are required; but these are not mentioned in the L. Pharmacopœia.

Solution—When a fluid, as water, alcohol, ether, oil, &c., overcomes the cohesion of a body, and incorporates its particles within itself, without decomposing them, itself remaining transparent. When unable to dissolve more, it is said to be saturated. Heat usually, but not always, increases the solvent power of a liquid. Solution is favoured by the quantity of the solvent, by division, and by agitation, also by pressure. Cold is produced during solution, from a portion of the caloric of the liquid being required to enable the solid to pass into the same state. Hence freezing mixtures are produced by dissolving salts in water, or by mixing them with ice or snow.

Solutions of a Homogeneous solid. 1. In pure Water, as of Acids, Alkalis, and of Salts, or of certain vegetable and animal principles, as Gum, Sugar, Starch, or of Gelatine and of Albumen. 2. In Alcohol and Proof Spirit. Vegetable Alkalis are very soluble in alcohol, so is Iodine. 3. In Ether: this solvent is little employed in the Pharmacopœia, but is capable of dissolving many of the same substances as Alcohol, and more of some resins and fats. 4. In Oil. This dissolves Camphor and some of the acrid and narcotic principles of plants, whence the French employ several Oils.

Solutions of a Heterogeneous solid are differently named, according to the temperature employed. 1. Maceration, is an operation performed at ordinary temperatures, as from 60° to 80°, and which is continued for some time, as from 12 hours to a few days. *a.* With pure water as a solvent, forming cold infusions, which are useful when we wish to prevent aroma being dissipated, or to obtain a light infusion, free from principles which would be taken up if heat was employed. *b.* In Rectified or Proof Spirit, forming Tinctures, the former for the resinous, and the latter for the more gummy products of plants. The Tinctures may be either *Simple* or *Compound*, that is, when one, or when more than one, substance is acted upon by the solvent. Sometimes Ammonia is added, forming Ammoniated Tinctures. *c.* Ether is occasionally employed in making what are then called Ethereal Tinctures. *d.* Wine, used as a solvent, forms Medicated Wines, and is preferred for taking up some of the soluble principles: as in Vinum Colchici, V. Ipecacuanhæ, V. Opii, V. Veratri. *e.* Vinegar is used as a menstruum and preferred for some vegetable principles; but in most cases it is probable that some chemical change is also produced, as in Acetum Opii, A. Colchici, A. Scillæ.

2. Percolation is a kind of Maceration, but superior to it in its power of exhausting a body of its active soluble principles. This is effected by more minute subdivision of the solid, and by passing the liquid through it, and thus bringing all its particles in contact with the whole of the menstruum. The solvent can then be used upon fresh portions of solid, which may be similarly exhausted until the liquid becomes of the desired degree of strength.

3. Digestion is similar to Maceration, but the action is promoted by a heat from 90° to 100°.

4. Infusion—When boiling water, that is, at 212°, is poured on the leaves, barks, or roots, &c. of plants, and allowed to cool down. Many substances require first to be bruised or cut, so as to be permeable to the water. Polished metallic vessels, as they cool more slowly from radiating heat less freely, are usually preferred to make infusions in.

5. Decoction—When boiling water is used, and kept boiling for a shorter or longer period, all the principles soluble in water become

dissolved, and some others are suspended with them. Decoctions are preferred when the full effects of some medicines are required. In other cases the aromatic principles are dissipated.

VAPORIZATION — By this operation liquid bodies become converted into vapours or gases. This may take place only at the surface of the liquid, when it is called Evaporation; or, if the vapour is formed by the addition of caloric throughout the whole mass, Ebullition.

Evaporation is adopted when a volatile liquid is allowed to escape, and a solid residue retained for use; as in the case of Extracts, Inspissated juices; or in crystallizing salts, as in obtaining sea-salt. Evaporation, when taking place at ordinary temperatures, is called *spontaneous* evaporation; and as it takes place at the surface, shallow vessels with broad surfaces are necessary. During evaporation, cooling ensues, in consequence of the quantity of caloric required for the liquid to exist in the gaseous state. Hence the coolness produced by evaporating lotions, by water in porous vessels, &c. The rate of evaporation increases as temperature is increased or pressure removed; hence it occurs at a much lower temperature in vacuo. *Inspissated Juices* are reduced to comparative dryness by this process. Where the active principles of a vegetable or animal have been obtained in solution in alcohol or water, and are by such a process reduced to a proper consistence, we obtain *aqueous or alcoholic extracts*. As these are apt to be injured by heat, so it is of advantage to prepare them at as low a temperature as possible. Hence the superiority of those prepared in vacuo.

Ebullition taking place by additions of heat to the mass of liquid, a large quantity of caloric becomes latent (or hidden) to enable the liquid to exist in a gaseous state. The boiling point varies in different liquids. Ether boils at 100°, Alcohol at 173·5°, Water at 212°, Oil of Turpentine at 316°, Mercury at 656°. It is also influenced by other circumstances, but especially by pressure, as fluids boil at 140° lower temperature in vacuo than in the open air. When pressure is increased, the boiling point is raised, and often also the solvent powers of the fluid. Boiling is employed in making Decoctions, &c. and also in the process of Distillation.

Distillation is employed in separating a volatile liquid from other substances which are either fixed or less volatile than itself. It consists of two processes; first, the application of heat to convert the volatile substance into vapour, and then the condensation of this vapour, in a separate vessel, into a liquid. The operation may be performed in a retort or still, to either of which a receiver, kept cool, or a refrigeratory, must be fitted. The vessels may be of metal, of glass, or of earthenware, and the heat applied either directly or through the medium of a sand, water, or steam bath.

Distillation of Water. Distilled water is required to be employed in all the Pharmacopœia Preparations.

„ Distilled waters. These contain a little of the volatile principles of plants, and may be distilled either off the plants, or by distilling some Essential Oil with water.

„ Essential Oils. Volatile Oil being diffused through the different parts of various plants, these are, if necessary, coarsely divided, and soaked in water. The oil is then distilled over with the water, from which it is afterwards separated as it floats upon the surface.

„ Acids. As of Acetic, Nitric, Hydrochloric, Hydrocyanic acids, &c. of Vinegar for purification.

„ Alcohol. This is first obtained in the form of Raw Spirit. It is rectified for the purpose of purification, and also for concentration, and has then a Sp. Gr. of ·835, while that of Proof Spirit is ·920. Rectified Spirit may be further strengthened by distilling it off Carbonate of Potash or dry Chloride of Calcium, which retain the water, while the volatile Alcohol is distilled off.

„ Distilled Spirits. These are colourless solutions in Alcohol of the volatile principles of plants, and are obtained by distillation in the same way as the distilled waters, but with rectified or proof spirit as the solvent.

Sublimation is distinguished from Distillation in the volatilized matter assuming a solid form on condensation, as in the cases of Sulphur, Sal Ammoniac, Iodine, &c.

Condensation. In the Processes of Distillation and of Sublimation bodies are first converted into vapour, and then reduced to the liquid or solid state by the simple reduction of temperature. The condensation of gases, or those which are permanent at ordinary temperatures and pressure, may be effected by increasing the pressure or by the application of great cold. Prof. Faraday, by combining the condensing powers of mechanical compression with that of very considerable depressions of temperature, has obtained a pressure equal to 50 atmospheres, and a cold equal to — 166° of Fahrenheit's scale, and has thus liquefied many previously uncondensed gases. Condensation of a gas may also be effected mediately, that is, by passing it through a liquid for which it has some affinity, or through which it may become permeated: *ex.* Solution of Ammonia, Liquid Hydrochloric acid, Carbonic acid water. The terms Congelation or Solidification are employed when a body assumes the solid form from the mere reduction of temperature.

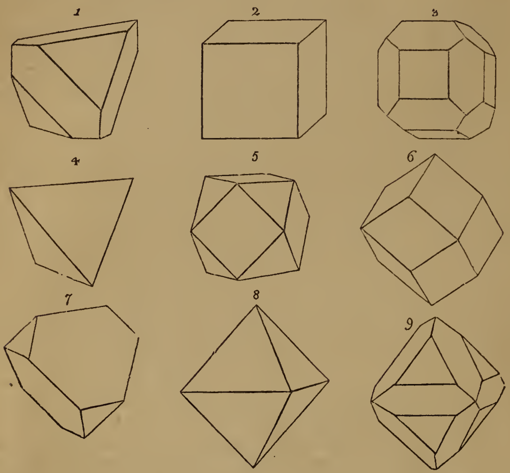
PRECIPITATION is the process by which a body, previously in solution, is caused to pass to the solid state so rapidly as to prevent the particles arranging themselves in any regular form, and therefore the *precipitate* falls as a more or less fine powder.

CRYSTALLIZATION. When bodies, in passing from the liquid or gaseous state, assume regular geometrical forms, the process is called *crystallization*, and the solid bodies, *crystals*. This may be effected by gradually cooling down any melted mass, as Sulphur, the Metals; or a vapour, as Sal Ammoniac or Corrosive Sublimate; or by slowly evaporating the liquid in which a solid may have been dissolved. The process, then, depending on evaporation, requires to be performed in broad and shallow vessels. It is favoured by the presence of foreign bodies, &c. and by agitation; but the crystals then produced are small, as also when the process is quickly performed.

The majority of crystals, when deposited from their watery solutions, carry with them a certain portion of water, which they render solid, but much of which they also part with by the mere application of heat or by exposure to the air. This is called *water of crystallization*, and it exists in crystals in its equivalent proportion, or some multiple of it. Professor Graham considers a portion of this water, when it replaces a base, as essential to the *constitution* of the salt. This is then sometimes described as *water chemically combined.* A salt or body *combined* with water is called a *hydrate*, one without any, *anhydrous.* Salts which contain much water of crystallization, when heated, undergo aqueous fusion, and, the water being dissipated, they are left as dry salts: *e.g.* burnt Alum. Some, when exposed to the air, lose this water, and are said to *effloresce;* others absorb water, and are said to *deliquesce;* while those which undergo no change in the air are called *permanent.*

Crystals are also studied with respect to their forms and the nature of their formation. Crystallography is now an extensive and independent science, the principles only of which we need notice, as they are treated of in separate works, as well as in systems of Chemistry. As many substances have forms peculiar to themselves, it is necessary to be acquainted with those which characterize different pharmaceutical salts, as they may thus be distinguished even when very minute. Some forms, however, are common to several distinct minerals, and these are therefore sometimes grouped together according to their external characters. The forms of these crystals have been distinguished into those which are *Primary*, and others which, from being considered as modifications of them, are called *Secondary.* That the *external forms* are connected with a certain regularity of *internal structure*, is evident from the well-known facts of the *cleavage* of crystals, also their refraction of light and different degrees of expansion by heat. The primitive forms are,—1. The Cube. 2. The Tetrahedron, contained under four equilateral triangles. 3. The Oc-

tohedron, contained under eight equilateral triangles. 4. The Hexangular Prism. 5. The Rhombic Dodecahedron, limited by twelve rhombic faces; and 6. The Dodecahedron with isosceles triangular faces. The secondary forms may be produced by modifications of the above, as by decrements of particles taking place on their *edges* and *angles*, which would produce a great variety of forms. Thus the Octohedron, Tetrahedron, and others, may be produced from a Cube, and many secondary forms from each.



Though there can be no doubt that the internal structure of crystals must be as regular as their external figures, because it seems evident from the unequal expansion and contraction of certain crystals by changes of temperature, and also from their different modes of refracting light, yet, to use Mr. Daniell's words, crystallographers now confine themselves to the experimental determinations, and the geometrical relations of their exterior forms. Crystallography is now founded upon our ideas of the regular and exactly similar distribution of two, three, four, or any number of parts in symmetrical order; and on the law that if one of the primary planes or axes of a crystal be modified in any manner, all the symmetrical planes and axes must be modified in the same manner.

The introduction of a systematic arrangement of crystalline forms according to their degrees of symmetry, is due to the labours of Weiss

and Mohs, and its principles are explained in Prof. Daniell's Introd. to Chemical Philosophy. The classes and the forms which are referred to there will be enumerated here, as many of them are mentioned in the descriptions of crystals in this work.

I. *Cubic, Octohedral, or Regular System*, having 3 rectangular axes all equal; contains the Cube, Regular Octohedron, Tetrahedron, Rhombic Dodecahedron, and Trapezohedron. II. *Right Square Prismatic System:* 3 rectangular axes, 2 equal, contains Square Prism and Octohedron with a Square base. III. *Rhombohedric:* 3 equal axes, not rectangular; 1 perpendicular to the 3; Rhombohedrons, Bipyramidal Dodecahedrons, Hexangular Prisms. IV. *Right Rectangular or Rhombic Prismatic:* 3 rectangular axes, no two equal; Right Rectangular Rhombic Prism, and Right Rectangular, and also Rhombic Octohedron. V. *Oblique Rectangular or Rhombic Prismatic:* 2 axes oblique, the third perpendicular to both. Oblique Rectangular and also Rhombic Prisms; Oblique Rectangular and also Rhombic Octohedrons. VI. *Double Oblique Prismatic:* 3 axes, all intersecting each other obliquely; Doubly Oblique Prism and also Octohedron.

By these various processes are obtained the Pharmaceutical preparations which are known by the names of Solutions, Tinctures, Wines, Vinegars, Infusions, Decoctions, and Extracts; also Distilled Waters; Spirits and Essential Oils; likewise some Precipitates and Salts, though the production of these depends chiefly upon Chemical Decompositions and Combinations. (For a full account of the different processes consult Kane's Elements of Pharmacy.)

PHARMACEUTICAL CHEMISTRY.

Substances which are throughout identical in nature, are subject only to the ordinary laws of Physics; but when substances different in nature, and minutely subdivided, come into contact, or are placed at insensible distances from each other, they become subject to a series of changes consequent on Chemical Attraction or Affinity. The result of this attraction is to unite two or more bodies together into one which has properties usually very different from the bodies of which it is composed. One great object of Chemistry is to determine what bodies are compound, and what, from the inability of chemists to separate them into more simple bodies, should be considered as *Elements.* These are at present about 55 in number; a majority of the most important of them form objects of study in Materia Medica, either in their simple form, or as constituents of compound bodies.

As most bodies, when judged of by external characters, appear to be homogeneous, or composed of only one substance, the object of the Chemist is to ascertain whether this is actually the case, or only appa-

rent. This he does either by the Action of Heat, or by presenting to the compound body some other substance which has a greater affinity for one of its constituents, so that the other may be set free. This is called *Analysis*, or the separation of a Compound Body into its *constituent* parts, the quantities of each being, if necessary, ascertained. As a Compound Body is capable of combining with other bodies, which may themselves be either simple or compound, it is clear that by the process of *Chemical Analysis* a complex body may be reduced either into the substances from the immediate union of which it has been formed, and which are called its *Proximate Principles*, or into the *elementary* substances of which the latter consist, and which are then called its *Ultimate* Principles. When the constituent principles of a body can be so reunited as to reproduce the substance which has been analysed, the process is called *Chemical Synthesis*, and is the most certain proof of the correctness of an analysis.

These Decompositions and Recompositions, or Combinations, form the chief occupation of the Chemist, are always going on in the great operations of nature, whether of growth or of decay, and require to be studied especially with regard to the laws by which they are governed, which are called those of Chemical Affinity. It has been ascertained that though some substances, as Alcohol and Water, unite in any proportion, and others, as Salt and Water, in any proportion up to a certain extent, yet that the majority of substances which form *true* Chemical combinations, unite only in *one* or in a *few fixed* and *definite* proportions. This forms the basis of what is called the doctrine of Chemical Equivalents, Definite Proportions, or the Atomic Theory, the facts alleged in support of which have been ascertained by numerous experiments, though the explanations are theoretical.

The combination of Bodies is much influenced by the different states in which they are brought into apparent contact, and much favoured by bodies being brought into the state of liquids, and also in many cases by heat, as is fully detailed in works on Chemistry. It is requisite to allude to the points requiring to be studied, in order to understand even the ordinary Pharmaceutical preparations. Bodies, it has been stated, combine with one another, not only in one, but often in several *definite* proportions; and it has further been ascertained that the quantity of the equivalent of one of them in the different combinations is found to be exactly double, triple, or some multiple of that of the other, and in the ratio either of 1 to 1, 2, 3, or 4, &c. or of 1 to 3, 5, 7. This is indicated by a peculiar *Nomenclature.* The *weights* of these equivalents have been ascertained by experiment to differ from each other. Hence their relative differences are pointed out by *Numbers*, which are in most instances peculiar to each of the *elementary* bodies. For the convenience also of a brief mode of stating all the facts respecting the composition of a Chemical substance, particular letters are adopted as the *Symbols* of the different Elements, as also *Formulæ*, which express the sum and differences of the substances

employed in chemical decompositions and their results. Hence attention must be paid to the Equivalents, which are also supposed to be the atomic weights of Chemical Elements, the *Symbols* by which these are distinguished, and to the *Nomenclature* by which the composition of a Body is at once known. The great advantage of attending to these points is the facility which it gives for understanding complicated changes, especially in Organic Chemistry. They also show the exact quantities which are sufficient to produce particular changes, and indicate also the weights of the products which should be obtained.

To indicate the composition of Bodies as well as the proportions in which they are combined, a peculiar nomenclature is employed by chemists. Thus, Binary compounds which are not acid, of the non-metallic elements, as Oxygen, Chlorine, Iodine, Bromine, have their names terminating in *ide*, as Oxide, Chloride, Iodide, Bromide; also of the compound body Cyanogen, as Cyanide; of other substances, as Sulphur, Phosphorus, in *uret*, as Sulphuret, Phosphuret.

The number of Equivalents or Combining weights in a compound is shown—Of the first-mentioned element by a Latin numeral, as Bis, Ter, *e.g.* Binoxide of Mercury, indicating that 2 equivalents of Oxygen are combined with 1 of Mercury. If 2 equivalents of one body combine with 3 of another, that is, in the proportion of 1 to $1\frac{1}{2}$, this is indicated by the word *sesqui*, as Sesquioxide, Sesquichloride. The first oxide is sometimes distinguished as the Protoxide. The affix of *Per* to an acid or an oxide indicates the highest proportion of Oxygen, &c. as Peroxide, Perchloride, Percyanide. The numbers of the second-mentioned element are indicated by Greek numerals of division, as Dis, Tris, *e.g.* Diacetate of Lead, where 2 equivalents of Oxide of Lead are combined with 1 of Acetic Acid.

The nature of the acidifying principle of acids is indicated by the term *Oxyacids* being applied to those containing Oxygen, and *Hydracids* to those acidified by Hydrogen, with the word *Hydro* prefixed; as in Hydrochloric. Acids containing the largest proportion of Oxygen have their names terminating in *ic*, as Sulphuric acid, and those of their salts in *ate*, as Sulphate, Nitrate. A smaller quantity of Oxygen in the acid is indicated by the termination *ous*, as Sulphurous; their salts terminate in *ite*; while the addition of *Hypo* indicates a smaller quantity of Oxygen than in the compounds to the names of which it is prefixed, as Hyposulphuric, Hyposulphurous. The excess of acid in a salt is indicated by calling it an *acid* or a *super-salt*, and the deficiency of the acid, by calling it a *sub-salt*; or, to show the excess of base, or of that which combines with and masks the properties of the acid, by calling it a *basic salt.* Double and Triple salts have their composition pointed out by the names of their Principles being all mentioned, as Tartrate of Potash and Soda or Potassio-Tartrate of Soda. A triple compound of the elementary bodies, as Oxygen, Hydrogen, and Carbon, as in Creosote, is called an Oxyhydro-carburet.

Substances combined with water are called *hydrates*, as the Hydrate of Lime; and as it seems in some cases to act the part of a base, it is then called *basic* water. Compound bodies, such as Cyanogen, which unite with elements as if they were themselves simple substances, are called *radicles*. There are many among organic compounds. These groups of a few elements in infinitely varied proportions are capable of combining with elementary substances and with one another, and of being substituted the one for the other, according to the laws of definite, multiple, and equivalent proportions. (Daniell, Chem. Phil. p. 604.)

The Symbols by which Elementary substances are distinguished are the first letters of their names in Latin, sometimes with the addition of a small second letter. The following elements comprise those which are most generally diffused, and of about half of which the greatest portion of material substances are composed. All of these form components of articles in the Materia Medica. The Numbers of the Equivalents are those adopted by Professors Brande and Daniell, or by Mr. Phillips in his Translation of the Pharmacopœia. In these, as generally in this country, Hydrogen is taken as unity, and being found in water combined in the proportion of 1 with 8 equivalents of Oxygen, the number of the latter is taken as 8. As these numbers are arbitrary, so others may be assumed : hence Oxygen, on the Continent, is made 100; but, as the others must all be proportional, Hydrogen will then become 12·5. Whole numbers are generally chosen as equivalents on the Hydrogen scale, in accordance with the views promulgated by Dr. Prout, and since generally adopted.

NON-METALLIC ELEMENTS.

Oxygenium	O	8	Brominium	Br	78
Hydrogenium	H	1	Sulphur	S	16
Nitrogenium	N	14	Phosphorus	P	32
Carbon	C	6	Boron	B	11
Chlorinium	Cl	36	Silicon	Si	15
Iodinium	I	126			

METALLIC ELEMENTS.

*Kaligenous Metals.**

Kalium (Potassium)	K	40	Natrium (Sodium)	Na	24

Terrigenous Metals.

Alkaline Earths.			*Earths Proper.*		
Barium	Ba	69	Aluminium	Al	14
Calcium	Ca	20			
Magnesium	Mg	12			

* Ammonium is a hypothetical metal, and might be enumerated here. But it will be mentioned under the head of Ammonia.

Metals Proper.

Manganesium	Mn	28	Stannum	St	59
Ferrum (Iron)	Fe	28	Stibium (Antimony)	Sb	129
Zincum	Zn	32	Arsenicum	As	75
Cuprum	Cu	32	Hydrargyrum	Hg	200
Bismuthum	Bi	213	Argentum	Ag	108
Plumbum	Pb	104	Aurum	Au	200

As some names occur very frequently, especially under the head of Tests, it is sometimes found convenient to make use of abbreviations, independent of the Symbols, and without reference to the composition of a body. Also for Pharmacopœia, the letter P., and L. E. D. for London, Edinburgh, and Dublin.

Thus for, Water	Aq.	Citric Acid . . .	Cit′
Distilled Water	Aq. dest.	Potassa . . .	P. or Pot.
Sulphuric Acid .	S′ or Sul′	Soda	So.
Carbonic ,, .	C′ or Carb′	Chloride of Barium .	Cl. Ba.
Phosphoric ,, .	P′ or Phosp′	Nitrate of Silver . .	Nitr. Arg.
Oxalic ,, .	O′ or Ox′	Sulphuretted Hydrogen	Sulph.Hydr.
Acetic ,, .	A′ or Acet′	Ammonia . . .	Am.
Nitric ,, .	N′ or Nitr′	Cyanogen . . .	Cyan.
Muriatic ,, .	M′ or Mur′	Hydrocyanic Acid . .	Hydrocy′
Tartaric ,, .	T′ or Tar′	Ferrocyanide of Potassium	Ferrocy.Pot.

The above Symbols not only indicate their respective Elementary substances, but when alone, always stand for 1 Eq. of that Element. To indicate more than 1 Eq., numerals are added to the Symbols, as 2C, 3C, or O_2, O_3, O_4, &c. As these elements combine together, and form compounds always constant in nature, the composition of these is indicated by the juxtaposition of Symbols, or by placing the + sign between them, as H O or H+O, indicating 1 Eq. of Hydrogen combined with 1 Eq. of Oxygen, as in water. Numerals are added if more than 1 Eq. be present, as C 2 O or C O_2, indicating that 1 Eq. of Carbon is combined with 2 of Oxygen, as in Carbonic Acid. Each compound has its own Eq. number, which is made up of the sum of those of its components. Thus H O=1+8=9, or the sum of the Eq. numbers of Hydrogen and Oxygen. So C O_2=22, because 1 Eq. of Carbon, 6, is added to 2 Eq. of Oxygen, 8×2=16. Here it may be seen that the Eq. number of Oxygen is the same in both cases, as it is indeed in all others, because these elements always combine together in the same relative proportions. This is the case also with the compounds, of which the Eq. number is always the same, and which are subject to the same law of definite proportions as the elements. Their composition is expressed in the same way. Thus, H O+S O_3, or H O, S O_3, means, in either case, 1 Eq. of Water combined with 1 Eq. of Sulphuric acid, a compound formed of 3 Eq.

of Oxygen with 1 of Sulphur, having as its Eq. No. $9+(8\times 3+16)=49$. When a large figure is printed before a symbol, it multiplies every symbol to the next comma, or to the next + sign, or all placed within brackets. When the Equivalent proportions of a compound are unknown, or when it is wished to state the per-centage of the components of a known body, the following method is adopted: thus

Wax is stated to be composed of

Carbon	81·874
Hydrogen	12·672
Oxygen	5·454
	100·

And Carbonate of Magnesia of

Magnesia	41·6
Carbonic Acid	36·0
Water	22·4
	100·

Besides combining in equivalent weights, substances have, when in a gaseous state, a certain relation to each other with respect to their bulk, and combine in certain proportions, that is, one measure or Volume with one or more Volumes of another gas. The resulting measure of the compound gas is either equal to the sums of the volumes of its components, or, in consequence of chemical union, it is condensed into a smaller compass, which, however, bears to the former a certain ratio. This, therefore, requires to be noticed in an account of a gas.

By taking advantage of the tendency of bodies to combine, and of the power of others to decompose them, are obtained the different Chemical preparations of Pharmacy. Thus by the mere process of Torrefaction or Roasting, some of the volatile parts of a body are expelled, while others undergo a change, or oxygen is absorbed. This process, therefore, closely resembles Oxygenation, where oxygen is induced to combine with other substances, either by exposing them to the influence of pure Oxygen, or to that in the atmosphere, or by acting on them with a body, as Nitric acid, containing much Oxygen (cohobation). Deflagration takes place when a metallic body is ignited with a Nitrate, when the Nitric′ yields its Oxygen, and the metal is oxidized. The process is the converse of Reduction, where whatever is combined with a metal, as Sulphur or Oxygen, is driven off by heat, this result being sometimes assisted by the presence of a flux. Such a proceeding is called Calcination, when, instead of a simple metal, a base or oxide is left behind. By different methods of Decomposition, various acids are obtained from their salts. They are distinguished into Oxygen Acids, as the Nitric, Acetic, &c., and Hydrogen Acids, as Hydrochloric and Hydrocyanic. So the alkalis and other bases are obtained by the decomposition of their salts, as *e.g.* solution of Potash. The various salts may be formed by bringing together the acids and bases, whether the latter be alkaline, earthy, or metallic oxides, in the requisite proportions, and ascertain-

ing the saturation of neutral salts by means of litmus or turmeric paper. Some of the elementary substances, when in the same manner combined, form compounds which are called, from resemblance in nature to common salt (ἅλες), *haloid* salts. Such are Chlorides, Iodides, and Bromides of metals. When an atom of water is present, such a compound cannot be distinguished from a Hydrochlorate, Hydriodate, or Hydrobromate, and thus comes naturally under the category of *Salts:* thus

$$KCl+HO=KO, HCl.$$

For forming these compounds the law of definite proportions is of great value, as it informs us of the exact quantities of each substance to be employed, because the equivalent numbers indicate not only the proportion in which one body combines with another, but also that in which it will combine with every other. So if two neutral salts are mixed together, and mutually decompose each other, the results will also be two neutral salts, &c. Finally, the processes of Fermentation yield us our different Spirits, Wines, and Vinegars, as will be explained under their respective heads, and, under Etherification, the effects of acids on Alcohol.

MANUAL OF MATERIA MEDICA.

PART FIRST.

INORGANIC KINGDOM.

MINERAL AND CHEMICAL SUBSTANCES.

Seeing that Bodies are either Simple or Compound, and that the latter may be analysed, or the former united, it is obvious that the study of natural substances may be commenced either with the simple elementary bodies, proceeding thence to the compounds; or some one of the latter with which we are well acquainted may be taken and separated into its ultimate principles, and these studied before proceeding to others. There are two bodies, with the appearance of which all are well acquainted, and which, though apparently elementary, are now well known to be compound bodies. These are Atmospheric Air and Water, the nature and composition of both of which require to be studied before many of the processes for preparing articles of the Materia Medica can be understood.

Atmospheric Air.

F. Air Atmosphérique. G. Atmosphärische Luft.

The Atmosphere, which everywhere surrounds the globe, extends to a height of 45 miles. It is an invisible gaseous body, devoid of odour and of taste, compressible, easily expanded by heat. Its Sp. Gr., according to the experiments of Sir G. Shuckburgh, is ·001208 at 60° Fahr., and the Barometrical pressure of 30°, water being taken as a standard. But being usually taken itself as the standard of comparison for gases, it is then reckoned = 1. 100 Cubic Inches weigh 31·0117 grains, and its pressure at the level of the Sea is equal to 15 pounds upon each square inch of surface, or a column of air one inch square, and extending to the limits of the atmosphere, weighs

about 15 pounds, or the same as a column of Mercury, also one inch square, but only 30 inches high, which it is thus able to balance and support by the pressure of its weight. This weight must necessarily vary at great depths, as well as at great heights, as a greater or less mass of air will be superimposed. Hence the Barometer is employed for measuring heights, a diminution of one inch being found equal to about 1000 (922) feet. From being compressible, its density necessarily varies at different heights, the inferior strata being dense, and the upper ones rarefied. The temperature also diminishes as we ascend into the atmosphere, at the rate of 1° F. for every 100 yards, or, more correctly, for every 352 feet.

Though apparently simple in composition, it is actually composed of two very distinct gaseous bodies, Oxygen and Nitrogen, and a small portion of Carbonic Acid gas. The proportions in which these exist are, in 100 parts:

Nitrogen gas	77·5 by measure,	75·55 by weight.
Oxygen gas	21 ,,	23·32 ,,
Aqueous vapour	1·42 ,,	1·03 ,,
Carbonic Acid gas	·08 ,,	·10 ,,

Omitting the aqueous vapour, which is variable in quantity, sometimes amounting, in hot countries, to as much as 2 per cent., the proportions of the permanent gases are stated by Humboldt, from experiments by himself and Gay Lussac, to be:

Nitrogen gas . .	0·787 by measure.
Oxygen gas . . .	0·210 ,,
Carbonic Acid gas . .	0·003 ,,

or, omitting the Carbonic Acid gas, 77 by weight of Nitrogen, with 23 of Oxygen, or by volume 79·2 of the former and 20·8 of the latter in 100 parts.

The presence of Ammonia, in small quantities, has been detected by Liebig; and some Nitric acid is found also after thunder-storms. It has been imagined that some Hydrogen gas may exist in atmospheric air; and Hydrochloric Acid, it is said, has been detected in it at the sea-shore.

Dr. Murray has observed, that the Atmosphere may be regarded as a collection of all those substances which are capable of existing at natural temperatures in the aërial form, and which are disengaged by the processes carrying on at the surface of the earth. These, with other substances, as watery vapour, the effluvia from animals and vegetables, independent of Heat, Light, and the Electric fluid, form a vast mixture, the composition of which it is apparently impossible to determine.

Chemical Analysis has, however, proved that the various substances which may be mixed with the atmosphere quickly disappear, and are not to be detected by Chemical Tests, and that the composition of the air

is everywhere uniform. It must, however, be admitted, that in very crowded assemblies of people, where there is a want of circulation, the quantity of Carbonic Acid gas is a good deal increased. It was at one time supposed that the constituents of the Atmosphere were retained by Chemical Attraction. Dalton, however, promulgated the opinion, that they were mechanically mixed, that the particles of the *same* gases repel, but that the particles of *different* gases do not repel, one another; and that thus one gas acting as a vacuum to another, and each being repelled by its own particles, they become diffused. Professor Graham has ascertained that each gas has a diffusive power, or *Diffusiveness*, peculiar to itself, which is inversely proportional to the square root of its density, and by which it tends to mix with other gases.

The properties of Atmospheric air are a mean of those of its constituents, and its chemical actions are due to the oxygen; by this it is enabled to support combustion; also the respiration of animals, a portion of it being by them converted into Carbonic Acid. Fishes depend upon its presence in the water, though this dissolves only a small portion of air, but more of its Oxygen than of its Nitrogen. The processes of vegetation are also dependent upon the atmosphere, as it conveys water and also Carbonic acid to the leaves of plants, where the Carbon becomes fixed, and the Oxygen again set free; and thus plants contribute to purify the air which might become deteriorated by the respiration of animals. As the atmosphere varies in the quantity of moisture it contains, so it assists in the distribution of water over the surface of the globe, and is, by its mobility, the principal agent by which the extremes of temperature are moderated. According to the temperature and moisture of the atmosphere, so is the rate of evaporation, and consequently of perspiration. Hence not only do many pharmaceutical operations require a knowledge of the constitution of the atmosphere, but some of the functions of the body must be influenced by its different states, and the action of some classes of Medicines modified by its different degrees of density and of dryness.

Oxygen.

Oxygen. *Vital Air.* *F.* Oxygène. *G.* Sauerstoff.

Oxygen (Symb. O. Eq. N. 8), was named by the French chemists from οξυς, *acid*, and γεννaω, *I generate*, having been supposed by Lavoisier to be the only generator of acids. It was not discovered until in 1744 by Priestley, though it is the most extensively diffused body in nature. It forms one-fifth by weight of the atmosphere, eight-ninths by weight of water, and probably not less than one-third of the solid crust of the globe; for Silica, Alumina, and Carbonate of Lime contain nearly one-half of their weight of Oxygen. It forms,

moreover, one of the constituents of both animal and vegetable bodies.

Prop. Oxygen is a permanent colourless gas, devoid of odour and of taste. It is somewhat heavier than common air, as, at a temperature of 60° F. and a Barometrical pressure of 30 inches, 100 Cubic Inches weigh 34·25 grains; it is sixteen times heavier than an equal bulk of Hydrogen gas. Its Sp. Gr. is 1·111. 100 volumes of water dissolve 3·5 of the gas, but by pressure water may be made to take up much more of the gas. (Aqua Oxygenii or Oxygen Water.) Oxygen has most extensive affinities, combining with every other known elementary body, except Fluorine. The bodies which are thus formed vary much in their properties. Some of them are called oxides, others alkalis, both of which, however, are called bases, and combine with a third set, possessed of very different properties, and which are called acids, or oxygen acids. Some bodies combine slowly with Oxygen, others with great vehemence, and with the evolution of light and heat, as in the combustion of bodies in the air, but of which the brilliancy is much increased if taking place in Oxygen gas. The respiration of animals is, in fact, a kind of combustion; the Oxygen of the air combines with the carbon of the blood, and is expelled in the form of Carbonic gas. But vehemence of action is moderated by its being diluted with four-fifths of Nitrogen gas in the air. A gas with a peculiar smell, given off from the positive pole of the Electrical machine during its action, has been named *Ozone* by Prof. Schönbein; but Faraday has shown that it is probably a peculiar modification of Oxygen, the combining affinity of which is much stronger than that of the gas as commonly met with. By supposing its generation, it may be possible to explain the agency of light in the process of bleaching, and of the electricity in a thunderstorm in the production of Nitric acid from the Oxygen and Nitrogen of the atmosphere. The properties of Oxygen require to be well understood, both with reference to the functions of Life and the mode of action and preparation of many Medicines.

Prep. Heat powdered and dried *black oxide of Manganese* in an iron gas bottle, till it is red hot; collect the gas. 1 ℔ should yield from 40 to 50 pint measures. Or mix *black ox. Mangan.* and *Sul.'* to the consistence of cream, and distil in a glass retort. Or the *red oxide of Mercury* or *Nitre* may be heated to dull redness to obtain this gas. 100 grs. *Chlorate of Potash,* heated in a retort or tube, yield 100 C. 1. of very pure Oxygen.

Tests. A rough test of the purity of this gas is, introducing into it a *glowing* taper: if the gas be pure, the taper will immediately burst into a flame.

Action. Uses. Oxygen gas is stimulant when inhaled, and has hence been used, diluted with common air, in asphyxia, &c. Oxygen Water is a moderate stimulant, and may be given to the extent of a bottle or two daily.

Nitrogen.

Nitrogen. *Azote.* *F.* Azote. Nitrogène. *G.* Stickstoff.

Nitrogen (N = 14), the other constituent of the Atmosphere, was so called from being considered the producer of Nitre or of Nitrates. It was discovered in 1772 by Rutherford. Its properties may be considered the reverse of those of oxygen, as it will not support combustion nor the respiration of animals. In fact, it is fatal to them, but chiefly on account of the absence of oxygen. It is often called Azote, from α, *privative*, and ζωή, *life*. It is abundantly diffused, as it forms four-fifths of the atmosphere. Its chief use seems to be, to dilute the oxygen, though it no doubt also performs some more important functions. It exists also in small quantity in the Ammonia of the atmosphere, also in the Nitric acid which is found in it after thunder-storms. It forms a constituent of all animal bodies, and likewise of many vegetable products which form the food of animals.

Prop. Nitrogen in its simple state is best described by negatives, as it is devoid of colour, and is without taste or smell. It cannot support combustion, neither can it sustain respiration, and it is nearly insoluble in water. It is lighter than common air. Sp. Gr. = ·975; 100 Cubic Inches weigh 30·15 grains. It forms, however, numerous compounds with Oxygen, &c., many of which are possessed of very active properties: *v.* Nitric acid, Ammonia, &c.

Prep. Nitrogen may be obtained by burning *Phosphorus* carefully in a jar of common air, when the whole of the Oxygen being abstracted, the Nitrogen is left comparatively pure. Or a mixture of *Sulphur* and *Iron-filings* made into a paste with water, and similarly enclosed, will slowly absorb the Oxygen. It may then be further purified by passing it through Sulphuric acid to separate the water and Ammonia of the atmosphere, and then through Lime-water to abstract Carbonic acid.

Action. Uses. Nitrogen, being devoid of active properties, has been proposed to be employed in still further diluting common air in cases of excitement of the respiratory organs. Substances abounding in Nitrogen are the most suitable as food in some diseases.

Hydrogen.

F. Hydrogène. *G.* Wasserstoff.

Hydrogen (H = 1), from ὕδωρ, *water*, and γεννάω, *I generate*, does not exist free in nature, but combined is a constituent of water, of some acids, gases, and all vegetable matter. It was first correctly described in 1766 by Cavendish. It has hitherto been undecomposed, but several Chemists entertain the view that its base is analogous to a metal.

Prop. At common temperatures an invisible permanent gas, devoid of odour or taste; by exposure to intense cold, Faraday could not liquefy it. It is 14·4 times lighter than air, and its sp. gr.=·0693. 100 C. I. weigh 2·14 grains. Water dissolves $1\frac{1}{2}$ per cent. of its bulk of Hydrogen. When a lighted taper is brought in contact with the gas, it inflames, and burns with a pale yellow flame, uniting with the Oxygen of the air, and forming water. These gases, when mixed, do not unite until they are inflamed. Hydrogen, being the lightest body known, is assumed as the standard with which the equivalent numbers of other bodies are compared: its Eq. therefore is 1. But when Oxygen=100 is taken as the standard of comparison, H=12·5. It is interesting to us chiefly as being a constituent of Water, of Hydrocarbons, of Hydrochloric and Hydrocyanic acids, also of all vegetable and most animal substances.

Oxygen and Hydrogen.

Water. Aqua. (Distilled Water. Aqua Destillata, L. E. D.) *F.* Eau. *G.* Wasser.

Water (Aq. or HO=9), like the Air, is so universally diffused and well known, as not to require to be described. When pure it is colourless and devoid of both taste and smell; but it may contain many impurities without these properties being sensibly impaired; therefore, for Chemical and Pharmaceutical purposes Distilled water should be employed.

Like Air, Water contains Oxygen, but it differs in being a strictly chemical compound. The other element is Hydrogen. One Equivalent of Oxygen, 8, is combined with one Eq. of Hydrogen, 1, making 9, the Equivalent number of water; which, therefore, or some multiple of it, is added to the equivalent number of chemical compounds when water is in combination. From its ready accessibility, water has been assumed as the standard of comparison for Specific Gravities. Its Sp. Gr. is therefore represented by 1, as in the L., or 1000, as in the E.P., as may be thought most convenient. Water, it is well known, freezes at 32°, of Fahrenheit's thermometer, but attains its greatest density at 40°, expanding at a lower temperature; therefore ice readily floats upon water. It boils at 212°, and is then converted into steam, of which the Sp. Gr. is ·625 at 212° F., when it has the greatest density, and is composed of one volume of Oxygen combined with two volumes of Hydrogen. One volume of water will form about 1700 volumes of steam, and in the production of the latter 1000 degrees of heat become latent, the sensible heat of steam not exceeding the boiling heat of water. But water passes at all temperatures into the air by spontaneous evaporation, and causes its greater or less moisture or dryness. It enters into intimate combination with various

bodies, which are then called Hydrates (from ὕδωρ, *water*), as in the cases of Lime and Potash, the Hydras Calcis and Hydras Potassæ L. P.; so also in some Liquids, as Sulphuric acid, and in Nitric acid, and in a variety of crystals; from these, however, a great proportion of water may be expelled by heat, and from some by mere exposure to the air. It forms a large proportion of most organized bodies, and dissolves a great variety of solid substances, and usually in increased proportion as its temperature is increased. It likewise dissolves many of the Gases, some, as Common Air, Oxygen, and Carbonic Acid gas, in small proportion; but others, as Ammoniacal and Hydrochloric acid gases, in immense quantities.

From the great solvent powers of water, it is seldom met with in a pure state. Rain-water even, contains some Carbonate of Ammonia or of Lime, which was floating in the atmosphere, and usually about 3½ cubic inches of common air in 100 cubic inches of water. Spring-water generally contains Carbonate and Sulphate of Lime and Chloride of Sodium, besides the usual proportion of air, and often Carbonic acid. Well-water, obtained by digging, usually contains a large proportion of salts, and is often called *hard* water, because it curdles soap by decomposing it. River-water, though proceeding from springs, deposits upon exposure to the air many of the salts it contained, and is hence called *soft* water, because soap readily mixes with it. It is found that water containing a certain proportion of salts is less likely to become deteriorated by contact with leaden pipes or cisterns than a purer water would be. Some Spring-waters contain so large a proportion of impurities, as to be called Mineral waters. They are arranged under the heads of Acidulous, Sulphurous, Saline, Calcareous, and Chalybeate mineral waters. Sea-water contains a still larger proportion of salts, especially common salt, with the Chloride of Magnesium and Sulphate of Magnesia.

Water necessarily commands a considerable share of attention, as it forms a portion of the aliment of both vegetables and animals; and from its great solvent powers it is an important agent in pharmacy, as with it are formed various aqueous solutions, Distilled waters, Infusions, Decoctions, and it is employed to dilute Acids, Alkalies, and Spirits. It is useful also in some processes by becoming decomposed, when its Oxygen serves to oxidize different bodies, and its Hydrogen escapes in the form of gas. For Chemical and for most Pharmaceutical operations Distilled water (the Aqua Destillata of the Pharmacopœia) is required to be employed.

As a Therapeutical agent, also, water plays an important part, as it is often the best medium for applying either heat or cold to the body; and as it forms so large a portion of the blood, it is a chief means for increasing its fluidity, facilitating circulation, diluting secretions, and rendering them less acrid. It will act also as a solvent of many solid substances, as it passes through the system, and forms the principal part of Diluent and Demulcent Remedies.

SULPHUR.

Sulphur. *Brimstone.* *F.* Soufre. *G.* Schwefel.

Sulphur (S=16), from *Sal*, salt, and πυρ, *fire;* was employed in medicine by the Greeks, Arabs, and Hindoos. It occurs in some Animal substances, as Albumen in Eggs, &c., in some plants, as in Cruciferæ, Umbelliferæ, Garlic, Fungi, &c., but chiefly in the Mineral Kingdom; also combined, as in gases or salts, in some minerals, and in mineral waters. It is frequently found in combination with metals, as in the common ores called Pyrites,—the Sulphurets of Iron, of Copper, Lead, Mercury, &c., whence it is obtained by roasting, in Germany, Sweden, and this country; part of the Sulphur is burnt into Sulphurous acid, another part, being volatilized without change, is collected in chambers. Native or Virgin Sulphur uncombined, is either a volcanic product, or occurs in beds in many parts of the world; that of commerce is brought chiefly from Italy, Sicily, and the adjacent islands, whence, in 1834, 485,756 cwt. of rough Sulphur were imported. It is afterwards purified by fusion, distillation, and sublimation, hence known under the names of Stick, Roll, Sublimed, and Flowers of Sulphur. Native Sulphur is purified by distilling it from earthen pots arranged in two rows on a large furnace. The Sulphur fuses and sublimes, and passes through a lateral tube in each pot into another placed on the outside of the furnace, which is perforated near the bottom, to allow the melted Sulphur to flow into a pail containing water, where it congeals and forms *rough* or *crude* sulphur. This being redistilled, forms refined sulphur. When fused and cast into moulds, it forms *stick* or *roll* sulphur.

Prop. An opaque brittle solid, crystallizing in acute octohedrons with an oblique base at temperatures below 232°, as from a solution of sulphuret of carbon, but when cooled gradually after fusion assumes the form of an oblique rhombic prism. Thus it is dimorphous. Fracture shining, crystalline. Sp. Gr. 1·98; when free from air-bubbles 2·080; that of the vapour is between 6·51 and 6·9. The colour in the solid state, when pure, is pale yellow; but it often varies from lemon-yellow, through green, dark yellow, and brown-yellow, according to the degree of heat to which it has been subjected. Taste insipid; odour generally none; acquires a faint and peculiar smell when rubbed. When grasped in the hand it cracks: roll Sulphur feels greasy to the touch. Sulphur has no action on Vegetable colours. It is insoluble in water, slightly soluble in Alcohol, especially when finely divided, or the two are brought together in a state of vapour; in the same manner it is soluble in Sul. Ether, in Oil of Turpentine, and in most fat and essential Oils, also in alkaline solutions, petroleum, &c. It is inflammable; when heated to about 300° in the open air, it takes fire, and burns with a pale blue, and at higher tempera-

tures a purple flame. It is a non-conductor of heat; when heated to about 180° it begins to volatilize, to fuse about 216°; between 226° and 280° it becomes perfectly liquid, and of a bright amber-colour; about 320° it begins to thicken, and becomes of a reddish-colour, and so viscid, that the vessel may be inverted without its running out. If in this state it is poured into water, it remains soft like wax for some time, and has been used for taking impressions of Seals, &c.; it may then be drawn into threads, which are elastic. From 482° to its boiling point, 600°, it becomes more fluid, and at that point, if air be excluded, sublimes unchanged as an orange vapour. On cooling, it passes again through the same transitions; if slowly cooled, it forms a crystalline mass, or frequently retains its fluidity till touched by a solid body.

Sulphur is an elementary body, though it so often contains traces of Hydrogen that it was at one time thought to be a compound of that gas. It is exceedingly important as a chemical agent, forming Sulphurets with the various metals; with Oxygen it forms acids, of which the Sulphurous and Sulphuric are officinal; with Hydrogen, Hydrosulphuric Acid or Sulphuretted Hydrogen. It undergoes no alteration in the air at common temperatures. That of commerce, obtained from Pyrites, is often contaminated by metallic impurities, as Zinc (Carbonate and Sulphate), Iron, (Oxide and Sulphuret), Arsenic (the Sulphuret), Silica, Magnesia, Alumina, and Carbonate of Lime. Flowers of Sulphur are sometimes contaminated by the presence of a minute quantity of Sulphurous (stated by some to be Sulphuric) Acid, formed by a portion of the Sulphur during Sublimation uniting with the Oxygen in the apparatus. It should be freed from acidity by washing with hot water, after which it should not affect Litmus paper.

Tests. Known by its colour, fusibility, volatility, burning with a blue flame, and the evolution of the pungent vapours of Sulphurous acid gas formed during its combustion. It should completely evaporate when heated to 600°, and be perfectly soluble in boiling Oil of Turpentine. It should have no action on Litmus. If fused with Carbonate of Soda, and tested with a drop of the solution of Dr. Playfair's Nitroprusside of Soda, a beautiful purple is produced.

SULPHUR PRÆCIPITATUM. L. Precipitated Sulphur. *Lac Sulphuris*, or *Milk of Sulphur.*

This is omitted from the other British Pharmacopœias, on account of its impurity, nearly two-thirds by weight of that of the shops being Sulphate of Lime. It is very similar in most of its properties to sublimed Sulphur, but is whiter. It contains a little water. The impurities may easily be detected by heat, which will cause the Sulphur to evaporate, when the Sulphate of Lime will be left behind; or by the microscope, by which the crystals of the latter are seen. To prepare it, one part of sublimed Sulphur is boiled with 2 parts of

slaked Lime in 8 parts of water. To the solution thus produced, which contains Sulphuret of Calcium and Hyposulphite of Lime, Hydrochloric acid is added in sufficient quantity to form with the Lime Chloride of Calcium, and Sulphur is precipitated. Sulphuric acid may be fraudulently substituted for Hydrochloric, when Sulphate of Lime falls down along with the Sulphur.

Precipitated Sulphur is smooth and white, and seems to hold a little water in combination with it. It consists of microscopic granules smaller than those of sublimed Sulphur.

OLEUM SULPHURATUM. Sulphurated Oil. *Balsamum Sulphuris, Balsam of Sulphur.* Is now omitted from the Pharmacopœia. It was obtained by boiling Sulphur and Olive Oil, stirred together in a large iron vessel, until they gradually united. It is a dark reddish-brown viscid substance, having a very disagreeable smell.

SULPHUR (SUBLIMATUM), L. E. D. Sublimed Sulphur.

Prepared by reducing Sulphur to a coarse powder, and then subliming from a large iron retort into a sulphur-room, where the vapour is immediately condensed. Pulverulent, but when examined under a microscope, seen to be composed of small granular masses.

Prop. Its characters are the same as those of Sulphur.

Prep. E. Sublime *Sulphur* in a proper vessel, wash the powder obtained with boiling *water*, till the water ceases to have an acid taste. Dry the Sulphur with a gentle heat.

Tests. Evaporates totally at a temperature of 600°. Agitated with Aq. Dest., it has no action on Litmus. Heated with Nit′, the solution diluted with water, neutralised with Carb. of Soda, and acidulated with Mur′, should not yield a yellow precipitate with Sulphuretted Hydrogen,—showing the absence of Arsenic. *v. Sulphur.*

SULPHUR LOTUM. Washed Sulphur.

Prepared by washing *Sublimed Sulphur.*

Action. Uses. Alterative, Diaphoretic, mild Cathartic.

D. gr. v and gr. x.—℈i. two or three times a day as an alterative; ℈i.—ʒiij. as a laxative.

UNGUENTUM SULPHURIS, L. E. D. Sulphur or Brimstone Ointment.

Prep. L. Mix thoroughly *Sulphur* ℔. ß. with Hog's Lard ℔. j. E. D. Similar: half as strong.

Action. Uses. Alterative, chiefly applied in Scabies and other skin diseases.

UNGUENTUM SULPHURIS COMPOSITUM, L. Compound Sulphur Ointment.

P. L. Mix *Sulphur* ℥iv., bruised *Veratrum* ʒx., *Nitrate of Potash* ℈ij., *Soft Soap* ℥iv., *Lard* ℔j.

Action. Uses. Irritating stimulant, applied in obstinate Scabies.

CONFECTIO SULPHURIS, D. Confection of Sulphur.

Prep. Take of *Sublimed Sulphur* ℥ij., *Bitartrate of Potash* ℥j., *Clarified Honey* f℥j., *Syrups of Ginger* and *Saffron* āā f℥ß. Triturate all in a mortar, until they are intimately mixed. A useful laxative Cathartic.

SULPHUR AND OXYGEN.

ACIDUM SULPHURICUM. Sulphuric Acid. *F.* Acide Sulphurique. *G.* Schwefelsäure.

Sulphuric Acid ($S\,O_3 = 40$) is one of the most important compounds of Chemistry. This acid is produced in small quantities in nature, as near volcanoes, in some acid springs, and exists in combination in numerous Sulphates, especially those of Lime (*Gypsum*) and of Magnesia, found as minerals, or in the water of springs. It was known to the Arabs, Persians, and Hindoos.

Sulphuric Acid appears, from its names, to have been originally made in Europe, and probably also in Persia, from the decomposition of Vitriol or Sulphate of Iron, a practice still followed at Nordhausen in Saxony. The Sulphate is first calcined, so as to expel nearly the whole of the water (of crystallization) it contains. The acid, distilled off in an earthenware retort at a red heat, comes over in vapours, which condense into a dark-coloured oily-looking liquid. This fumes when exposed to the air, and contains less than 1 Eq. of Water to 2 of Sulphuric Acid, has a Sp. Gr. of 1·9, and is known in commerce as the Nordhausen, Fuming, or Glacial Sulphuric Acid.

Prop. Sul′ may be obtained in a free or anhydrous state by carefully heating the Nordhausen Acid obtained from Sulphate of Iron in a retort, and condensing its vapours in a bottle artificially cooled. It then forms a white solid, fibrous like Asbestos, with some fine acicular crystals. At 66° it becomes liquid, and boils at 122°. Sp. Gr. 1·97. The dry acid does not redden litmus; when exposed to the air, dense white fumes are produced, from its condensing atmospheric moisture. It will combine with Water with explosive violence.

ACIDUM SULPHURICUM, L. Sulphuric Acid. Oil of Vitriol. *Vitriolic Acid. Spirit of Vitriol.*

Prop. Liquid Sulphuric′ (S′, Sul′, or $S\,O_3\,H\,O = 49$) is a dense oily-looking liquid, usually colourless, devoid of smell, but intensely

acid, and powerfully corrosive. At first it feels oily, from destroying the cuticle, but soon acts as a caustic, charring both animal and vegetable substances by combining with the water and setting free the carbon. It freezes at from —15° to —29°, according to its density, and boils at 620° F. Its affinity for water is great, heat and condensation being produced on their union. It absorbs moisture from the atmosphere, $\frac{1}{3}$ of its weight in 24 hours, and 6 times its weight in a twelvemonth, and consequently becomes weaker the longer it is exposed. Professor Graham is of opinion that S′ combines with water in several definite proportions. It may be diluted with it to any extent. It unites with alkalis, earths, and metallic oxides, rapidly dissolving some metals, as Iron and Zinc, when diluted with water. By the action of S′ on alcohol, Ether is produced. Several substances, as Charcoal, Phosphorus, Copper filings, &c., when heated with S′ decompose it, by abstracting its Oxygen, and evolving Sulphurous Acid.

Prep. S′ is generally made in this country by burning the imported Sulphur with a little Nitre. After the great increase which took place in the price of Sulphur, some manufacturers employed that obtained from Pyrites, which often contains Arsenic as an impurity. The proportion of Nitre is $\frac{1}{9}$, which is burnt with Sulphur either in the same chamber, lined with lead, and having its bottom covered with water, or in a furnace, from whence the vapours produced are conveyed into a similar chamber. The Sulphur in burning combines with 2 Eq. of Oxygen, and forms Sulphurous Acid gas, which escapes into the chamber. The N′ of the Nitrate, becoming decomposed, gives 3 Eq. of Oxygen to another Eq. of Sulphur, and thus some Sulphuric Acid is formed, which combining with the Potash of the Nitrate, forms Sulphate of Potash, which remains as a residual salt. The 2 Eq. of Oxygen set free, form with the Nitrogen, Nitric oxide, which immediately takes 2 Eq of Oxygen from the Atmosphere, and forms Nitrous Acid gas, or $N\,O_4$; so that this, with Sulphurous Acid gas, coexist in the atmosphere of the chamber, and if both are dry, no change occurs; but if moisture be present in the form of vapour, the Sulphurous Acid takes an Eq. of Oxygen from the Nitrous Acid, and becomes converted into Sulphuric Acid, while the latter becomes Hyponitrous Acid; these with a little water combining together, precipitate as a crystalline solid, forming a kind of Sulphate of Hyponitrous Acid. Immediately, however, on falling into the water, this compound becomes decomposed with effervescence. The Sulphuric Acid unites with the water, and the Hyponitrous Acid escapes as Nitric Oxide and Nitrous Acid. These unite with the Oxygen of the atmosphere, react on the Sulphurous acid and humidity, and give rise to a second portion of the crystalline compound, which undergoes the same changes as at first. Thus the Nitric oxide is the medium for transferring Oxygen to the Sulphurous acid, to convert it into Sulphuric acid.

The mode of making Sul′ now varies from the above in many places, and has been described by Professor Graham. In this process Sulphurous Acid, from burning Sulphur, Nitric Acid vapour, and steam, are simultaneously admitted into oblong leaden chambers, so partitioned that the vapours can only advance slowly, and thus allow the whole of the Sulphuric Acid to be deposited.

When the S′ thus made has a Sp. Gr. of 1·5 (1·6 Gr.), it is drawn off, and is usually first conveyed to shallow leaden pans, where it is concentrated to a Sp. Gr. 1·70, or until it would act upon the Lead. It is then further boiled down in retorts of glass or of Platinum, until it has a Sp. Gr. of 1·84; when cooled, it is removed into larger carboys, and forms the *Oil of Vitriol* of commerce. S′, in its most concentrated state, is a definite compound of 1 Eq. Acid and 1 Eq. of Water, which last cannot be separated by heat, as the acid and water distil over as a hydrate. The Sp. Gr. of the Acid Sulph. of the L. P. is 1·843—100 grains are saturated by 285 grains of Cryst. Carbonate of Soda.

Tests. The presence of S′, or of the soluble Sulphates, is easily ascertained by a solution of Chloride of Barium, or of the Nitrate of Barytes, as they form a white precipitate of Sulphate of Barytes, which is insoluble in either acids or alkalis. S′ should be colourless: Sp. Gr. 1·843. What remains after the acid has been distilled to dryness should not exceed $\frac{1}{400}$ part of its weight. Diluted S′ is scarcely coloured by Hydrosulphuric′. The want of colour indicates the absence of organic matter. Mr. Phillips states that the acid of Sp. Gr. 1·843 consists of 4 equivalents of the Anhydrous Acid to 5 of Water. Commercial S′ is apt to contain Nitrous Acid, or an oxide of Nitrogen and Sulphate of Lead. When diluted with its own volume of water, a scanty muddiness is produced by the deposition of Sulphate of Lead, alluded to by the L. P., and pointed out by the H S′, which forms a Sulphuret of Lead. No orange fumes escape when no Nitrous acid is present, which, as well as Binoxide of Nitrogen, is indicated by a solution of the Protosulphate of Iron.

In consequence of some S′ being now made from the Sulphur obtained from Iron Pyrites, which often contains some Arsenic, this metal, in the form of Arsenious acid, is sometimes present. "Dr. G. O. Rees found 22·58 grains of this acid in f℥xx. of oil of vitriol, and Mr. Watson states, that the smallest quantity which he has detected is 35½ grains in f℥xx." (Per. p. 356). For the detection of this impurity, the acid must be diluted, and the tests for Arsenic, q. v. applied. This is why the L. C. provide that no *yellow* precipitate shall be thrown down on the addition of H S.

Acidum Sulphuricum purum, E. D.

Dilution with water and subsequent concentration is recommended by some, but the E. and D. P. give processes for purifying Sul′.

Prep. The D. P. directs distillation of *Sul'* in a retort of flint glass, containing a few slips of Platinum, to restrain the ebullition; the first tenth part is to be rejected as containing too much water. Sp. Gr. 1·846.

E. P. If commercial Sulphuric acid contains Nitrous acid, heat f℥viij. of it with between 10 and 15 grains of Sugar, at a temperature not sufficient to boil the acid, till the dark colour at first produced shall have nearly or altogether disappeared. This process removes the Nitrous acid. Other impurities may be removed by distillation, as in D. P., but in a sand-bath, or with a gas-flame, and having a canopy above to keep it hot. Sp. Gr. 1·845.*

Dr. Christison finds that the Sulphuric acid, which is first rendered black and opake, gradually becomes pale yellow if kept for two hours near its boiling point, and that the Nitrous acid entirely disappears, without any material impregnation of Sulphurous acid. The proportion of sugar required must be first determined by an experiment on the small scale.

Tests. v. *Sul'*. Density 1·845; colourless; dilution causes no muddiness; solution of Sulphate of iron shows no reddening at the line of contact when poured over it. E.

Inc. Many medicinal substances are incompatible with S', as the Oxides of the Metals, some of the Earths, the Alkalis, and the Carbonates of all, also their Acetates, &c. The solutions of Lead and Lime. The former it is especially necessary to remember, as it is often desirable to prescribe both Sul' and Acetate of Lead in the same cases.

Action. Uses. Caustic, corrosive poison, astringent.

Antidotes. Chalk, Whiting, Magnesia, Soap. Dilution, Demulcents.

ACIDUM SULPHURICUM DILUTUM, L. E. D.

Prep. L. Mix gradually *Acid Sulph.* f℥xv. with water f℥xx.; as much only of the water is to be added as will make one pint of the whole.

E. and D. f℥j. to f℥xiij.

Heat is evolved, condensation ensues, and a little Sulphate of Lead is precipitated. The three Diluted Acids are necessarily of different strengths. Prepared according to the L. P., it has a Sp. Gr. of 1·103, and f℥j saturates 27 grains of crystallized Carbonate of Soda. That of the E. diluted acid = 1·090; of the D. = 1·084. Their comparative strengths are as 98, 88, 84. The dilute acid of the L. P. contains 12·43 per cent. of dry $S\,O_3$, or exactly one drachm in the ounce. It is a little weaker than that in the last Pharmacopœia.

Action. Uses. Refrigerant, Astringent, Tonic.

D. ♏x.—♏xxx. diluted with water, some bland liquor, or some bitter infusion.

Infusum Rosæ Compositum, contains about ♏ivß in each f℥.

* Or 1845. But, to avoid confusion, the decimal point is inserted here and in other places.

Acidum Sulphuricum aromaticum, E. D.

Prep. E. Add gradually *Sulph'* f℥iij.ß. to *Rectified Spirit* Ojß. Let the mixture digest at a very gentle heat for three days in a close vessel. Add *Cinnamon* bruised ℥jß. *Ginger* do. ℥j. moistened with a little of the acid spirit, and after twelve hours the powders may be exhausted by percolation with the rest of the spirit. Or the mixed powders may be digested for six days in the spirit, then straining the liquor. D. Similar: same strength.

This is intended to be a simple form of the Acid elixir of Mynsicht, and is a pleasant method for exhibiting Sulphuric Acid, as it is merely diluted with spirit instead of with water, with the addition of aromatic principles; Dr. Duncan having ascertained that the alcohol and Sul′ mixed in the above proportions do not react on each other, as has been sometimes supposed.

Phosphorus. L.

F. Phosphore. *G.* Phosphor.

Phosphorus (P=32), from φως, *light*, and φεϱω, *I bear*, though so remarkable a substance, was not discovered before 1669, in the Phosphate of Soda and Ammonia of Urine, by Brandt, an alchemist of Hamburgh. Knuckel in Germany and Boyle in England had also the credit of discovering it. The Continent was for some time supplied with Phosphorus from England, prepared by Hankwitz, an apothecary of London. It is now procured almost entirely from the ashes of bones, which consist chiefly of Phosphate of Lime. It is a constituent of other animal substances, and also of some vegetables. It occurs in the mineral kingdom in the form of phosphates, which give fertility to some soils.

Prop. Phosphorus is a soft, flexible, easily cut, semi-transparent, wax-like solid, Sp. Gr.=1·89 colourless, or yellowish, devoid of taste as well as smell when pure; but immediately it is exposed to the air, garlicky fumes are evolved, and it becomes luminous in the dark, in consequence of its combination with Oxygen: this slow combustion produces heat, and sets it on fire. It is so inflammable as to take fire spontaneously in the open air; hence it is requisite to keep it under water, as the least friction excites heat enough to make it do so. When air is excluded, it melts at 108° F., and boils at 574°, passing off as a colourless vapour; at 32° it is crystalline and brittle, and from its solution in hot naphtha it may be obtained in dodecahedral crystals. Phosphorus is insoluble in water, but if kept long in it, some of the water becomes decomposed; and, if in closed vessels, according to Berzelius, the water becomes luminous if agitated. The Phosphorus also acquires a white coat, and, if much exposed to the light, becomes of a reddish tint. This has been thought to be an Oxide or a Hydrate, but has been shown by Rose to be only a peculiar mechanical state. Prof. Schrötter has shown that common Phosphorus may be changed into this red kind by being heated for some

time in closed vessels. It is then brittle and metallic in appearance, having lost its luminous and waxy character. It is not so combustible or fusible, and is unchanged in the air. When heated to 460° F. out of the air, it becomes again common Phosphorus. By the aid of heat P. is soluble in Alcohol, Ether, the fixed and volatile Oils, in Naphtha, Petroleum, Sulphuret of Carbon, &c.

Prep. It is obtained on the large scale by the action of Sulphuric acid on powdered bone-ash, which consists chiefly of Phosphate of Lime. This is digested with half its weight of S′ diluted, which unites with a portion of Lime, &c. A Superphospate of Lime is formed by the remainder of the Phosphate combining with the Phosph′ set free. This is dissolved out, filtered, and evaporated. It is then mixed with one-fourth its own weight of Charcoal, and some fine quartz sand, and strongly heated. The Carbon takes the Oxygen of the Phosphoric acid, becoming Carbonic Oxide, which passes over. Phosphorus is evolved, and received under water in the form of a reddish brown fusible substance. It is purified by pressing it, when melted, through chamois leather, also by melting in hot water in glass tubes, from which, on cooling, the Phosphorus separates in little sticks. This is the form in which it is usually met with in commerce.

Tests. Easily recognized by the above very remarkable characters.

Action. Uses. Irritant poison. Stimulant in very small doses. The red variety is nearly inert.

Antidotes. Dilution. Demulcents. Magnesia.

Phosphorus and Oxygen.

Phosphoric Acid. *F.* Acide Phosphorique. *G.* Phosphorsäure.

Phosphoric Acid (P′ or $P\,O_5 = 72$) was first distinguished in 1760 by Marggraff. Phosphorus unites with Oxygen, and forms oxides and acids. Phosphoric′ may be obtained by the first part of the above process for obtaining Phosphorus, by decomposing the solution of Biphosph. Lime by Sesquicarb. Ammonia, separating the Lime and heating the Salt obtained, during which Am. escapes and P′ remains; or by burning P. in Oxygen or in Air; or enabling it to obtain the Oxygen from some substance which parts easily with it, such as Nitric′. This last is the method adopted by the L. P. The compounds of Phosphorus with Oxygen are among those which are most interesting to chemists, and are fully treated of in chemical works.

Acidum Phosphoricum dilutum, L. Dil. Phosphoric Acid.

Prop. Diluted Phosphoric Acid is a colourless solution, having a Sp. Gr. of 1·064, without odour, having a powerful acid taste, and reddening Litmus. It forms salts with alkalis, earths, and metallic oxides. Even when in a concentrated state, the acid is not corrosive to organized structures. By evaporation it is reduced to a state of concentration and the appearance of a brown oily liquid, and is then a Hydrated Phosphoric acid. By an increase of temperature, it loses

more water, and becomes Pyrophosphoric acid. When the heat is raised to redness, another equivalent of water is lost, when it becomes Metaphosphoric acid. According to Graham, these acids differ in the amount of base with which they combine, true Phosphoric acid being $P\ O_5$, $3\ H\ O$—Pyrophosphoric, $P\ O_5$, $2\ H\ O$—and Metaphosphoric, $P\ O_5$, $H\ O$. Liebig considers the three acids as different, and that Hydrogen is united in each with a different compound radical. Mr. Phillips states that the dilute acid contains 8·7 per cent. of Phosphoric′. A fluid ounce should be saturated by 132 grains of cryst. Carbonate of Soda. Phosphoric Acid consists of 5 Eq. O 40 + 1 Eq. Phosph. 32 = 72, with 3 Eq. H O = 99.

Prep. L. Mix *Nitric Acid* f℥iv. with *Dist. Water* f℥viij. in a retort placed in a sand-bath, and add *Phosphorus* ʒvj., then apply heat until f℥vj. have distilled over. Return these into the retort, and again distil over f℥vj., which are to be rejected. Evaporate the remaining liquid in a platinum capsule until f℥ij. only remain. Add to this acid, when cool, as much distilled water as will accurately fill up a pint.

Here, as explained by Mr. R. Phillips, diluted acid is used, in consequence of the explosion and rapid combustion which Phosphorus causes when added to strong Nitric′. With the diluted acid the action is slow, the Phosphorus gradually melts, and combines with a portion of the Oxygen of the acid, while the remainder escapes in combination with the Nitrogen of the Nitric′ in the form of Nitric oxide gas. A portion, however, of the Nitric′ distils over before the whole of the Phosphorus is acidified, and therefore it is necessary to return it into the retort as directed. The Platinum capsule is required in the latter part of the process, because when the acid becomes concentrated it would act upon the glass.

Tests. Phosphoric acid with Soda forms an officinal salt (the Phosphate of Soda). Lime-water produces in it a precipitate of insoluble Phosphate of Lime. This, and the Phosphates of Barytes, Strontian, Lead, &c. are soluble in dilute Nitric Acid, also in Ammonia. The Nitrate of Silver throws down a yellow precipitate of Phosphate of Silver in a solution of a Phosphate. Arsenious Acid is also similarly affected; but it may be distinguished from it by Hydrosulphuric Acid, which causes a yellow precipitate in the Arsenious, but none in the Phosphoric Acid. The addition of Carbonate of Soda ought to cause no precipitate if the acid contains no Lime as an impurity, which it is apt to do from the mode in which it is usually made. "Chloride of Barium or Nitrate of Silver being added, nothing is thrown down;" the first indicates the absence of Sul′, the second of Hydrochloric′. "Strips of copper and silver are not at all acted upon by it," showing that no Nitric′ is present; "nor is it coloured when Hydrosulphuric′ is added," indicating the absence of metals.

Action. Uses. Refrigerant, Acid Tonic.

D. ♏x.—fʒi. diluted with sugar and water.

Incomp. All such substances as are incompatible with other Acids.

Boron.

F. Bore. Borium. *G.* Boron.

Boron (B=11) was ascertained, by Sir H. Davy, in the year 1807, to be the basis of Boracic Acid. It was obtained by heating Potassium with Boracic Acid, as a dark olive-coloured powder, devoid of taste and smell, and not acted upon by the usual reagents; heated in the air or in Oxygen, it is converted into Boracic Acid.

Boracic Acid. Acidum Boracicum. *F.* Acide Boracique. *G.* Borax Säure.

Boracic Acid ($B\,O_3=35$) is so named from Borax, a salt long known, and which is a Biborate of Soda (q. v.); from the Soda of which it may be separated by the action of Sulphuric′: a soluble Sulphate of Soda is formed, and the Boracic Acid precipitated. Boracic Acid is largely obtained in Tuscany and in the Lipari Isles, where it issues in the steam from fissures in the earth. Circular basins are dug or the fissures surrounded with cylinders of brick-work, and water is let in, which boils up, from the vapour passing into and through it. The water, having dissolved the acid, is evaporated, and, as it cools, the acid is deposited in scale-like crystals, which are then dried.

Prop. Boracic Acid is usually seen in transparent scale-like crystals, which have a feeble acid taste, and redden Litmus slightly, at the same time that they colour turmeric brown, like an Alkali. It is sparingly soluble in cold, but requires less than 3 times its weight of boiling water to dissolve it. It is very soluble in Alcohol, tinging the flame of a green colour when it is burnt. The crystals contain 3 Eq. of water of crystallization, which is expelled on their being heated: the acid then melts, and on cooling is brittle and glass-like, and may be variously coloured. As the salts of this acid promote the fusion of other bodies, Biborate of Soda is much employed as a blowpipe flux.

Action. Uses. Boracic Acid is not officinal, except as a constituent of Borax, the Biborate of Soda. It was formerly supposed to have some anodyne properties, and was known by the name of *Sal sedativus.* It is now sometimes used to increase the solubility of Cream of Tartar, 1 part Bor′ with 7 parts Bitartrate of Potash forming the Soluble Cream of Tartar of the shops.

Silicon and Silica.

Silicon (Si=15) is a non-metallic element, which, in the state of oxide, forms a large portion of the crust of the globe, as Flint, Quartz, and Sand. It is obtained from Silica in the same way as Boron

from Boracic acid, though with great difficulty. It is a dark-brown insoluble powder; about twice as heavy as water; very infusible and not acted upon by any acid but the Hydrofluoric.

Silex Contritus (L.) or powdered flint, consists of Silica in a very pure state. Before powdering, the flint may be heated and thrown hot into water, when it will crumble in pieces. Silica ($Si\ O_2=31$) is also called Silicic acid, because it combines with bases. With a certain quantity of alkali, it forms glass, but with more of the alkali, a soluble silicate. The above form of Silica is employed by the L. C. in the preparation of distilled waters. The flint being very finely powdered, is rubbed up carefully with the essential oil, and then with the water, in which both are finely suspended. By this means the particles of volatile oil are intimately mixed with the water, and enabled to dissolve in it, before the distillation.

Nitrogen and Oxygen.

Nitrogen combines with Oxygen in several proportions, which it is desirable to notice, as illustrating the law of definite proportions, and because the several compounds are formed in the course of making various Pharmaceutical preparations.

Nitrous Oxide . .	$N\ O$,	$14 + 8 = 22$.
Nitric Oxide . .	$N\ O_2$,	$14 + 16 = 30$.
Hyponitrous Acid .	$N\ O_3$,	$14 + 24 = 38$.
Nitrous Acid . .	$N\ O_4$,	$14 + 32 = 46$.
Nitric Acid . .	$N\ O_5$,	$14 + 40 = 54$.

Acidum Nitricum, L. E. D. Acidum Nitricum purum, E. D. Nitric Acid, *Aqua Fortis*. *Spiritus Nitri Glauberi*. *F.* Acide Nitrique. *G.* Salpetersäure.

Nitric Acid (N' or $N\ O_5=54$) is an acid compound of Nitrogen with Oxygen. It was known to Geber, and probably also to the Hindoos. Cavendish first clearly ascertained its composition by forming the acid by passing electric sparks through atmospheric air over a solution of Potash. Phil. Trans. vol. 75, p. 572, and vol. 78, p. 261 (1785.) It may frequently be detected in the atmosphere after thunder-storms, in consequence of the Oxygen and Nitrogen combining together with the aid of electricity. In combination with Potash, Soda, and Lime, or Ammonia, it is found effloresced on the soil in some countries; also in some minerals; likewise in some vegetables, as in the officinal Pareira root, in the state of Nitrate of Potash.

Prop. Anhydrous Nitric′ has been obtained in prismatic crystals by treating Nitrate Silver with dry Chlorine—but the acid is generally

seen as a liquid in combination with water. When pure, it is colourless, transparent, of a very sour corrosive taste, destroying vegetable and animal matter. It tinges the skin yellow, by the formation of Xantho-proteic acid, and causes it to peel off; gives acid properties to a large quantity of water, vividly reddening Litmus and vegetable blues. It has a strong, almost suffocating odour, fumes in the air, from condensing its moisture; fumes still more if Ammonia be present. Its affinity for water is great, absorbing it from the air, and having its Sp. Gr. and strength diminished; when mixed with it, heat is evolved. Its strength necessarily depends on the quantity of water mixed with it; the density of the L. P. acid is 1·42; Mr. Phillips states that 1·504 is the strongest that can be procured by simple distillation; but it has been brought, by distilling with a gentle heat, by Kirwan to 1·55, and by Proust to 1·62. The E. P. also employs the Nitric′ of commerce, commonly called Aqua Fortis, of Sp. Gr. 1·380 to 1·390. Dr. Christison considers 1·500 as the densest acid which can be obtained free of Nitrous Acid, but, impregnated with this, it may be got so heavy as 1·540 and upwards. The purest Nitric′, if long exposed to light, becomes yellowish from decomposition, Oxygen being given out, and Nitrous Acid formed. This may be got rid of by the action of heat, as it escapes in the form of Nitrous fumes, leaving the Nitric′ nearly colourless. Nitric′ of Sp. Gr. 1·50 will freeze at—40° and will boil at 247°, but these points vary of course with the density; if the heat be continued, the acid volatilizes, and at a red heat is decomposed. At the density of 1·5 it consists of 2 Eq. of Nitric′ and 3 Eq. of Water, and it then contains about 80 per cent. of acid. Acid of Sp. Gr. 1·42 contains 60 per cent.; and the other may be reduced to this density by adding to it 34 per cent. of water. Graham regards the Pharm. acid as a *Nitrate of Water* with 3 Eq. also of *constitutional* Water, or, $N\,O_5$, $H\,O+3\,H\,O$.

Many vegetable substances, as Charcoal, Sugar, Alcohol, deprive Nitric′ of its Oxygen, also Phosphorus, and hence it is one of the most powerful oxidizing agents. The Metals do not in general decompose it when concentrated, but if diluted with water, this becomes decomposed as well as the acid, both yielding Oxygen to oxidize the Metal; the oxide is insoluble, or, being acted on by some of the undecomposed acid, a Nitrate is formed. The other part of the decomposed acid escapes in the form of Nitric oxide gas, which, uniting with the Oxygen of the atmosphere, ruddy fumes of Nitrous acid gas are observed. If Copper filings be used, then the solution will be of a greenish-blue colour. If Hydrochloric′ be mixed with the Nitric′, both become decomposed, and the mixture, called Nitro-Muriatic acid or *Aqua Regia*, is capable of dissolving gold.

The presence of N′ may be ascertained by the bright red colour produced when N′ touches Morphia or Brucia; saturated with Carb. of Potash, it forms Nitrate of Potash, which deflagrates. If heated with a strong solution of Protosulphate of Iron, slightly acidified

with SO_3, a reddish brown colour, of greater or less intensity, is produced.

Prep. Nitric′ may be formed by passing electric sparks through a mixture of 1 part of Nitrogen and 5 of Oxygen. The E. P. directs *Nitrate of Potash* and *Sulphuric Acid* in equal quantities by weight to be mixed together in a glass retort, and the resulting Nitric′ to be distilled by a naked gas flame.

To obtain a pure acid, the E. P. directs the Nitrate of Potash to be purified by two or three crystallizations, till Nitrate of Silver does not act on its solution in distilled water. The directions of the D. P. are similar; the acid prepared by them having a Sp. Gr. of 1·5. The L. P. gives no formula, but states the acid to have a strength of 1·42, and to be prepared from Nitrate of Potash. When manufacturers make N′, they employ only half the quantity of Sul′ and use Nitrate of Soda instead of Nitrate of Potash, because it is cheaper. The acid obtained is of a brownish colour, fumes, and is called Nitric acid of Commerce.

The quantities of Nitrate of Potash and Sulphuric′ of the Sp. Gr. 1·843, are very nearly in the proportion of 1 Eq. of the Salt to 2 Eq. of the acid. The two acids differ from each other in their relations with water, the Nitric′ requiring 2 Eq. and the Sulphuric′ only 1 Eq. of water; hence twice as much Sulphuric′ is employed as is necessary to saturate the Potash. A less proportion is used by many manufacturers, but the advantage of the process is, that a less heat is necessary, and a larger quantity and a purer acid, that is, more free of Nitrous Acid, is obtained. The Nitrate of Potash being decomposed by the Sulphuric′, the 2 Eq. of this combine with 1 Eq. of Potash, and form 1 Eq. of Bisulphate of Potash; the Nitric′, as set free, rises with the vapour of water, and forms aqueous Nitric′. This when of the greatest strength, or of Sp. Gr. 1·5033 to 1·504, is composed of 2 Eq. N′ + 3 Eq. Aq., and, containing then about 80 per cent. of acid, must be diluted to reduce it to the strength of the L. P.

Tests. The strength of N′ may be ascertained by its Sp. Gr., which, according to the L. P., is 1·42, in the E. and D. 1·50 (pure); 100 grains of the acid of the L. C. are saturated by 161 grains of cryst. Carbonate of Soda, (containing 60 per cent. NO_5). It should pass off wholly in vapour, showing the absence of any fixed salts, as of Potash, that is Nitre. The presence of Nitrous Acid is indicated by a yellow or orange colour: it may be got rid of by the gentle application of heat. Sulphuric′ is indicated by a white precipitate (Sulphate of Barytes) being formed when the acid, diluted, is tested with Sol. of Chloride of Barium, or of Nitrate of Barytes. Hydrochloric′ will be detected by a white precipitate (Chloride of Silver) being formed with solution of Nitrate of Silver. If it contain free Chlorine, it will have the power of dissolving gold, and of decolorizing a solution of Sulphate of Indigo. The Nitrate of Soda from Chili contains Iodine. Nitric Acid prepared from this is at first brown from the presence of Iodine (which may then be detected by starch), but after a time it

becomes colourless from the oxidation of the Iodine into Iodic Acid. (Pereira).

Action. Uses. Corrosive Poison, sometimes used as a Caustic and Disinfectant.

Inc. Alkalis, Earths, Oxides of Metals, their Carbonates, and Sulphurets, all combustible bodies, Hydrochloric', Alchohol, Sulphate of Iron, Acetates of Potash and Soda, Diacetate of Lead.

Antidotes. The carbonates of earths, as Chalk, Whiting; Bicarbonates of Alkalis; Soap.

ACIDUM NITRICUM DILUTUM, L. E. D. Dil. Nitric Acid.

Prep. L. Mix *Nitric'* (1·42) f℥iij. with *Dist. Water* f℥xvij.
E. One part of pure acid (1·5) with 9 of water.
D. Four parts of the same with 29 of water.

The Sp. Gr. of the L. acid is 1·082. (E. 1·077. D. 1·092.) It contains 12 per cent. of dry acid, and f℥j. will saturate 154 grains of cryst. Carbonate of Soda. The Edin. dilute acid contains 11·2 per cent. The Dublin is stronger than either, containing 13·5 per cent.

Action. Uses. Refrigerant, Tonic, Alterative.

D. ♏x.—♏xxx. diluted with water, &c. should be drunk through a quill, like the other strong acids.

IODINIUM. L. E. D.

Iodine. *F.* Iode. *G.* Iod.

Iodine (I=126), from ἰώδης, *violet*, the colour of its vapour, was obtained by M. Courtois in 1812 in the residual liquor of the process for obtaining Soda from Kelp. Though but lately discovered, its effects have long been obtained in medicine, as it is found in Sea and several Mineral waters, and in Sea-weeds, Sponge, Corals, and some Molluscous animals. In the present day, the leaf of a Sea-weed (a species of Laminaria, *Dr. Falconer*) is employed in the Himalayas, and called the *goître-leaf*, and in S. America the stems of a Sea-weed are sold by the name of *goître-sticks*, because they are chewed by the inhabitants wherever goître is prevalent.*

Prop. Iodine occurs in metallic-like scales. Its crystals may be obtained in elongated octohedrons with rhomboidal bases. It is of a bluish-grey colour, with a metallic lustre, an acrid taste, and an odour resembling that of Chlorine. Its Sp. Gr. is 4·94; but it is soft, and crumbles between the fingers, staining the skin of a yellow colour. It is rather insoluble in water, one grain requiring 7000 parts of water to dissolve it; but it is very soluble in Alcohol and Ether, forming reddish-brown solutions; it is also soluble in essential Oils. It evapo-

* Vide the Author's Illustr. of Himalayan Botany, p. 441.

rates at ordinary temperatures; but when heated, Iodine melts at 225°, and at 350° rises in a beautiful violet-coloured vapour, which is remarkable for its great weight, having a Sp. Gr., compared with that of air, = 8·7, but with that of hydrogen as 126 to 1. Hence its atomic number is 126, the atomic numbers of most simple bodies corresponding with the Sp.Gr. of their vapour. The solubility of Iodine in water is much increased by the presence of some salt in solution, and this is taken advantage of in preparing the compound solution of the London Pharmacopœia.

One of the most useful combinations that Iodine forms, is with Starch, as this serves as a very delicate test of its presence. If a solution of Starch be formed and allowed to cool, and then added, even though very diluted, to a solution containing Iodine, a blue precipitate of the Iodine in union with the Starch, or an Iodide of Starch, or of Amidin, as it has been lately called, will be produced. It is, however, essential that the Iodine be in a free state; hence in compound solutions it is necessary to add a few drops of a solution of Chlorine (or Chlorinated Soda), to detach it from its combinations, when the blue colour of the Iodide of Starch will immediately appear. A mineral acid may be used for this purpose, but it does not produce the colour directly, unless an Iodide and an Iodate are present at the same time. (*Vide* tests for Iodide potassium.) Chlorine simply sets free and displaces Iodine. An acid decomposes the solution of an Iodide, so as to form Hydriodic acid. If heated, or exposed for some time to the air, this combines with Oxygen, forming water and free Iodine. But Nitric′ containing the smallest quantity of Nitrous′ will act in the same way as a solution of Chlorine, for Nitrous acid will set free Iodine at once, as has been shown by Dr. Price. (P. J. xi. 133.)

Though present in a variety of situations, Iodine is obtained for commercial purposes from the ashes of Sea-weeds, called Kelp, and is largely prepared at Glasgow. Professor Graham states, that the long elastic stems of Fucus palmatus afford most of the Iodine contained in Kelp; and as this is a deep-sea plant, it is found most on exposed sea-coasts. Dr. Traill says, that the greatest quantity is produced by Kelp made from "drift-weed," which is in a great measure composed of Fucus digitatus and F. Loreus; and that "cut weed," which consists of F. vesiculosus and F. serratus, yields much less of it. It is also yielded in very large proportion by certain species of Laminaria, especially the common L. digitata. According to the experience of a manufacturer, 100 tons of Caithness kelp yield 1000 pounds of Iodine, or about a 224th part. (C.)

The most common method of obtaining Iodine is to take Kelp in powder, lixiviate with water, evaporate, and remove the Soda salts (such as the Carbonate and Sulphate) as they form; allow the liquor to cool, when crystals of Chloride of Potassium will be deposited. Decant the dark-coloured mother liquor, which contains the Iodide of Sodium with other salts; supersaturate with Sulphuric′, when an evo-

lution takes place of Carbonic′, Sulphuretted Hydrogen, and Sulphurous acid gases. After standing for a day or so, the residuary liquor, or Iodine ley, is mixed with Binoxide of Manganese, and heat applied. Water and Iodine pass over, and are condensed in receivers.

Here the mutual action of Sulphuric′ and Binoxide of Manganese on any Chloride in the Iodine ley, will be the detachment of Chlorine (*v.* Hydrochloric Acid). This, as stated above, will decompose the Iodide, and set the Iodine free; or, as usually explained, one equivalent of the Oxygen of the Binoxide, combining with the Sodium equally, sets the Iodine free, and the Sulphuric′ will combine with the Soda and the Oxide of Manganese, and thus form a Sulphate of Soda (the Oxide of Sodium), and a Sulphate of the Oxide of Manganese.

Tests. Iodine is sometimes adulterated with Charcoal, Plumbago, or Oxides of Manganese ; but its chief impurity is moisture, of which it sometimes contains as much as 15 to 20 per cent., when it looks wet, and sticks to the sides of the bottle. The L. P. directs its purity to be ascertained by its little solubility in water, solubility in Alcohol; and, when heated, by its first melting and then subliming in violet vapours, and rendering Starch blue. It further states that 39 grains of Iodine, with 9 grains of quicklime and f℥iij of water, when heated short of ebullition, should slowly form a perfect solution (Iodide of Calcium and Iodate of Lime), yellowish or brownish if the Iodine be pure, in consequence of a trace not being acted on, but colourless if there be above 2 per cent. of water or impurity. This test is adopted from the E. P.

Chloride, and Cyanide of Iodine, the latter due to the presence of marine animals in the Kelp, are occasionally found as accidental impurities.

For pharmaceutic preparations of fixed and uniform strength, the E. C. directs Iodine to be dried by being placed in a shallow basin of earthenware, in a small confined space of air, with ten or twelve times its weight of fresh burnt Lime, till it scarcely adheres to the inside of a dry bottle.

Action. Uses. Stimulant of the absorbents. Alterative.

D. gr. j.—gr. v. with some mild extract.

Antidotes. Large draughts of solution of Starch, both before and after evacuating the stomach; also obviate inflammation.

Iodinium Purum, D.

Commercial Iodine is to be purified by sublimation, the process being conducted for the first 20 minutes at a water heat. Any white crystals of Cyanide of Iodine, which may sublime at this period, are to be rejected.

Iodide of Starch, proposed by Dr. Buchanan, is a mild preparation. It is directed to be made by rubbing gr. 24 of Iodine with a little water, and gradually adding ℥j. of finely powdered Starch.

Dry by a gentle heat, and preserve the powder in a well-stoppered bottle.

D. ʒß gradually increased. It has been given in very large doses.

TINCTURA IODINEI, E.

Prep. E. *Iodine* ʒij.ß., *Rectified Spirit* Oij.

It contains 1 gr. in 16 ♏.

TINCTURA IODINII COMPOSITA, L. D.

Prep. L. Macerate *Iodine* ʒj., *Iodide of Potassium* ʒij. in *Rectified Spirit* Oij. until dissolved; strain. D. Same proportions.

It contains Iodine gr. j. and Iodide of Potassium gr. ij. in ♏ 40.

This and the *Liquor Potassii Iodidi Compositus*, *L.* are the best forms for internal exhibition. It may be given with water or sherry. ♏ x. gradually increased to fʒj.

UNGUENTUM IODINII COMPOSITUM, L. D. Ung. Iodinei, E.

Prep. L. Rub *Iodine* ʒß., *Iodide of Potassium* ʒj., and *Rectified Spirit* fʒj. together, then rub up with *Lard* ʒij. E. D. Same proportions.

Action. Uses. Employed as an external application in Bronchocele, scrofulous enlargements of the glands, or tumours.

The effects of Iodine as an external application, may be obtained by brushing the Tincture on the surface, or mixing it first with Soap Liniment and using it as an embrocation.

IODINE AND SULPHUR.

SULPHURIS IODIDUM, L. Sulphur Iodatum, D.

Prep. L. Put *Sulphur* ʒj. into a glass vessel, and place upon it *Iodine* ʒiv. Hold the vessel in boiling water until they have combined. Then, as soon as it has cooled, break the vessel; bruise the Iodine into fragments, and preserve it in a well-stoppered bottle. D. Similar.

By these processes a subiodide is produced, a black, semi-crystalline compound, having the odour of Iodine. It is used to make the following ointment.

UNGUENTUM SULPHURIS IODIDI, L.

Prep. Rub *Lard* ʒj. with powdered *Iodide of Sulphur* ʒß.

It is used externally in some forms of chronic skin disease.

BROMINIUM (L. 1836).

Bromine. *F.* Brome. *G.* Brom.

Bromine (Br=78), from βρωμος (*fœtor*), a strong odour, was discovered in 1826 by M. Balard, in *bittern,* the uncrystallizable residue of Sea-water. The quantity contained therein is so small, that 100 pounds of Sea-water yield only 5 grains of Bromide of Sodium or of Magnesium, of which 3·3 grains are Bromine. It exists also in rock-salt, in brine-springs, as those of Cheshire, in some mineral waters, sea-weeds, marine animals, and in the ashes of sponge.

Prop. It is a liquid of a dark red, but, in thin layers, of a hyacinth-red colour, easily volatilized, and therefore requiring to be kept well closed up, or covered by a stratum of water. The taste is acrid and unpleasant, the smell disagreeable and suffocating, something like Chlorine. The Sp. Gr. of liquid Bromine is 2·96, or 3·; that of its vapour, compared with air, about 5·4; 100 C. I. weigh gr. 168. It freezes at —4°, and congeals into a brittle crystalline solid, of a lead-grey colour and metallic lustre; and if water be present, it crystallizes in octohedra. At common temperatures, it rises into a reddish-brown vapour, like Nitrous acid, and boils at 116°. It stains the skin yellow, but not permanently, and acts as a caustic. It destroys vegetable colours, extinguishes flame, first turning the upper part red and the lower green; but some metals, as Antimony, &c., take fire in it. It is slightly soluble in water, more so in Alcohol, and very soluble in Ether; but it decomposes the Oils, Hydrobromic acid being formed.

Prep. Bromine may be detached from its combinations by passing Chlorine gas through a solution containing a Bromide, or by the action of Hydrochloric and Binoxide of Manganese on *bittern,* or on the mother-liquor of the salt-springs of Germany. The Hydrogen of the Acid, uniting with the Oxygen of the Binoxide, forms water; one portion of the Chlorine unites with the Manganese, and another with the metallic base, whether Sodium, Calcium, or Magnesium, with which the Bromine was combined. This being set free, easily distils over with water, and may be condensed in a receiver.

Tests. Bromine may be known by its liquidity, colour, weight, and acrid odour, by being sparingly soluble in water, more copiously in rectified spirit, best in ether; also by its ready volatility, its action on the metals, and by forming an orange-yellow colour with starch, and a yellowish-white precipitate (the Bromide) with Nitrate of Silver.

Action. Uses. A local irritant and caustic; increases the activity of the lymphatic system. It is sometimes used in combination with Potassium in Splenitis. It is omitted from the last edition of the Pharmacopœia.

D. 5 or 6 drops of 1 part of Bromine in 40 of Water or of rectified

Spirit. Externally as a lotion, or to moisten a poultice, a solution 4 times as strong.

Antidotes. The same as for Iodine.

CHLORINIUM.

Chlorine. *Dephlogisticated Marine* or *Muriatic Acid. F.* Chlore. *G.* Chlor.

Chlorine (Cl=36), pointed out by Scheele in 1774. The *Oxygenated Muriatic Acid* of Lavoisier, which Berthollet converted into *Oxymuriatic Acid*, as it was considered a compound of Oxygen and Muriatic′. Gay Lussac and Thenard considered it an element, and named it, from its characteristic yellowish-green (χλωρος) colour, Chlorine. It was proved to be an elementary body by Sir H. Davy in 1809. Chlorine is not found in a free state in nature, but combined with metals in great abundance in the inorganic kingdom, chiefly as Chloride of Sodium, Rock Salt, or Common Salt, or in the waters of the ocean, and also in the organic kingdom. Dr. Prout states, that free Hydrochloric′ exists in the stomachs of animals during digestion.

Prop. Gaseous Chlorine is of a greenish-yellow colour; its Sp. Gr. is 2·5. 100 C. I. weigh about 77 grs. Under a pressure of about 4 atmospheres, or when subjected to great cold, it is reduced to a bright yellow liquid. It has an astringent taste, and a suffocating, pungent odour, even when diluted with air. It is noted for its power of destroying vegetable colours; but, as this is only when water is present, and in light, it is supposed to be owing to the decomposition of the water, and the effect to be due to nascent Oxygen, which combines with colouring matter, the Hydrogen combining with the Chlorine to form Hydrochloric Acid. Cold water absorbs about twice its volume. It is also absorbed by Alcohol and organic substances; but it generally decomposes them, Hydrochlor.′ being formed. It combines with most of the simple bodies and metals, forming Chlorides; with Oxygen and Hydrogen, forming acids. It is incombustible, but partially supports combustion; the flame of a taper becomes red, small, and smoky in it; Phosph. and Antimony take fire in it spontaneously when in a state of division. It is a nonconductor of Electricity. Besides its bleaching properties, it is remarkable for its power as a disinfecting agent, correcting all putrid effluvia from decaying animal and vegetable matters, which depends, probably, upon its great affinity for Hydrogen. It is prepared on a large scale, or may be liberated from one of the officinal compounds.

Prep. Chlorine is obtained by heating in a retort *Common Salt* 4 parts, *Binoxide of Manganese* 3 parts, and *Sulphuric Acid* 7 parts, with an equal weight of *water*, or by the mutual action of *Binoxide of Manganese* and *Hydrochloric Acid*, when the Oxygen combines with Hydrogen to form water, one equivalent of Chlorine escapes, and another combines with the Manganese to form Chloride

of Manganese; or we may easily obtain it by adding an *acid* to the *chlorinated Lime* or *Soda* of the Pharmacopœias. It must be collected over warm water, as it is absorbed by cold water, and by Mercury, which combines with it.

Tests. Chlorine may be known by its colour, by its suffocating smell, and by its bleaching properties. Nitrate of Silver produces a white curdy precipitate (Chloride of Silver) in a solution containing Chlorine. This precipitate blackens in the light, is insoluble in Nitric′, but soluble in Ammonia, and melts into horn silver, *luna cornea.* Solution of Chlorine dissolves Gold leaf.

Action. Uses. Rubefacient. Disinfectant. Suffocating if inhaled.

Antidotes. Inhalation of Ammoniacal gas with care, and vapour of warm water. v. also *Liquor Chlorinii.*

Off. Prep. Liquor Sodæ Chlorinatæ. Calx Chlorinata.

Liquor Chlorinii, L. D. Aqua Chlorinei, E. Solution of Chlorine. *Liquid Oxymuriatic Acid.* *F.* Chlore liquide. *G.* Wässeriges Chlor.

A solution of Chlorine may easily be made by passing into water the gas obtained by any of the above processes. It is liable to be decomposed by light, Oxygen being evolved from the decomposition of the water, and H Cl formed by the combination of the Chlorine with the Hydrogen. The L. C. uses it only as a test, placing it in the appendix, and orders that it should be freshly prepared.

Prop. This solution has the pale greenish-yellow colour and suffocating smell of Chlorine (q. v.) with an astringent taste. Like the gas, the solution destroys vegetable colours, and likewise the effluvia of putrefying animal and vegetable substances. The effects may be obtained by exposing the solution to the air, or by the use of chlorinated Soda or Lime.

Prep. L. Mix *Hydrochloric′* f℥j. with powdered *Binoxide of Manganese* ʒij. in a retort, and allow the gas, so long as it continues to escape, to pass through half a pint of dist. water.

D. Similar: gentle heat being applied, and a washing-bottle used to guard against rising of the ingredients.

E. Commercial *Sul′* fʒij., to be agitated with *Muriate of Soda* ʒj. and *Red Oxide of Lead* gr. 350, with water f℥viij. in a stoppered bottle. Use when the red ox. has become white, and the insol. matters have subsided.

The L. process yields a pure solution of Chlorine. In that of the E. P., which, according to Dr. Christison, is convenient, though requiring time, the red oxide parts with some Oxygen to oxidate the Hydrogen of the H Cl. Protoxide of Lead being formed, unites with the Sul.′, leaving white insoluble Sulphate of Lead. The Soda also combines with the Sul.′, leaving Sulph. of Soda in solution along with the liberated Chlorine, but it does not interfere with the medicinal uses.

Tests. *v. Chlorine.*

Action. Uses. Irritant poison. Caustic. When diluted, stimulant, either internally or as a lotion or gargle. Cautiously used,

acts as an antidote in poisoning by Hydrocyanic′ and Sulphuretted Hydrogen.

It is employed in testing for Iodine, and used by the L. C. in the recognition of Morphia and Quina. If to a solution of Sulphate of Quina be added, first some fresh chlorine water, and then Ammonia, it turns green.

A solution of Acetate of Morphia treated in the same way becomes brown; but this colour is destroyed by excess of Chlorine.

D. ʒj.—ʒiv. in f℥viij. of vehicle, or as a lotion or gargle in 8 parts of fluid.

Antidotes. Magnesia, Chalk, Soap, Albumen, White of Eggs, Dilution.

Chlorine and Oxygen.

Like the other elementary bodies, Chlorine unites with Oxygen, and in several proportions; but as none are mentioned in the Pharmacopœias, it is unnecessary to do more than advert to these compounds. The highest oxidized of them is the Perchloric Acid. Chloric Acid consists of 1 Eq. Chlorine + 5 Eq. Oxygen; the salts are termed Chlorates, formerly *Oxymuriates:* the Chlorate of Potash, *Oxymuriate of Potash*, is officinal, *v.* Potassium.

Chlorine and Hydrogen.

Hydrochloric Acid Gas. Muriatic Acid Gas.

Hydrochloric or Muriatic Acid gas ($H\,Cl=37$) is a compound of Hydrogen and of Chlorine. It is sometimes found in a gaseous state in the neighbourhood of volcanoes. Combined with Ammonia, it is found in the cracks and fissures of lava, and in the cool parts of brick-kilns in India.

In its pure form it exists as a colourless gas with a pungent suffocating smell, acid taste, reddening vegetable blues, and making Turmeric paper brown. It has been reduced to a liquid state by cold, and by a pressure equal to 40 atmospheres at 50° F. Heat has no effect upon it. It extinguishes all burning bodies immersed in it. It has so great an affinity for water, that it attracts it from the atmosphere, producing the appearance of fuming. 100 C. I. of the gas weigh 39·77 grs.; Sp. Gr. 1·283. Water at 40° takes up 480 times its own volume of the gas, and thus forms liquid Hydrochloric Acid. It may be obtained by the direct union of its constituents, or by any of the methods described below.

Action. Uses. Suffocating, but sometimes used as a Disinfectant.

Acidum Muriaticum, E. D. Hydrochloric Acid. Muriatic Acid. Chlorohydric Acid. *Spiritus Salis. Spirit of Salt. Marine Acid. F.* Acide Hydrochlorique. *G.* Salzsäure, Chlorwasserstoffsäure.

This acid is a solution of the above gas in water. Geber and the Arabs were probably acquainted with it, and the Hindoos knew it by a name equivalent to *Spirit or sharp water of Salt.* This is the Commercial acid, and is always of a yellow colour. It commonly contains as impurities a little Sulphuric Acid, Nitrous Acid, Perchloride of Iron, Chlorine, and Bromine. It is prepared by pouring the Oil of Vitriol of commerce on Common Salt in earthen or iron vessels, especially since the extensive manufacture of Carbonate of Soda from Sulphate of Soda. Its Density, ex. E. P. = 1·180. For the Properties and Tests, *v. Acidum Hydrochloricum, L.*

Acidum Hydrochloricum, L. Acidum Muriaticum Purum, E. D.

Prop. It emits suffocating fumes. When pure, it is perfectly colourless, but is usually of a pale yellowish straw-colour, from the presence of a little Chlorine formed from the decomposition of the acid, when long kept, especially if exposed to light. It has a sour, irritating, and corrosive taste, with the odour of its gaseous acid. When heated to 112° it bubbles, from the quantity of H Cl gas which escapes. It freezes at —60°. H Cl combines with water in all proportions, with the evolution of heat. Sp. Gr. 1·16, when it contains about $\frac{1}{3}$ its weight of Hydrochloric Acid gas.

The action of this acid on some substances, as the Metals, Oxides, &c., requires attention, from the changes which take place in the various decompositions. Thus, when Zinc or Iron are acted on by liquid Hydrochloric′, Hydrogen is evolved in consequence of the decomposition of the acid, and the Chlorine, combining with the metal, forms a Chloride of Zinc or of Iron. But if an oxide of a metal be acted upon, no Hydrogen is evolved, because it combines with the Oxygen of the Oxide to form an equivalent of water, while the metal and Chlorine combine to form a metallic Chloride. Ammonia being a substance devoid of Oxygen, no decomposition of the acid takes place, and it therefore unites with the Ammonia to form Hydrochlorate of Ammonia. The same thing takes place with a vegetable Alkali, though it does contain Oxygen, but no action is considered to take place between it and the Hydrogen, and therefore the H Cl combines with the alkali, and forms a Hydrochlorate, as that of Morphia.

Prep. The last L. P. gives no formula of preparation, stating only that it is prepared from Chloride of Sodium, and should have a Sp. Gr. of 1·16, &c.

E. The pure acid is made from equal parts of purified Chlor. of Sodium, pure Sulphuric′, and water. The acid is diluted with one third of the water, added to the salt in a retort, and the gas distilled over into the rest of the water, placed in a cooled receiver. D. similar. The E. acid has a Sp. Gr. of

1·170, that of the D. P. 1·176; the former contains 34·2 per cent., the latter 35·4 per cent. of the gas.

In the above formula both the Chloride of Sodium and the water are decomposed. The Chlorine of the former, combining with the Hydrogen, forms Hydrochloric′, while the Oxygen of the water unites with the Sodium, to form Soda, which is seized upon by the Sulphuric acid to form Sulphate of Soda, which remains as the residual salt, and will be a Bisulphate of Soda if an excess of acid has been employed.

The E. P. directs equal parts by *weight* of the ingredients. The quantity of Sul.′ is greater than is necessary; but Dr. Christison says that less heat is required, and that the residual salt is more easily washed out with water. The salt is crystallized, to get rid of impurities, such as Nitrate of Soda, &c.

Tests. The presence of strong Hydrochloric′ is indicated by the white fumes which are produced in the neighbourhood of Ammonia; also by Nitrate of Silver producing in a solution containing it a white curdy precipitate (Chloride of Silver); this blackens in the air, is soluble in a solution of Ammonia, but is insoluble in Nitric′. Sp. Gr. 1·16. 100 grains saturate 132 of crystallized Carbonate of Soda. If pure, it is colourless. Strips of Gold are not dissolved in it, even with the assistance of heat; neither is Sulphate of Indigo decolorized; showing in both cases the absence of free Chlorine and of Bromine. After testing with gold leaf, a solution of Protochloride of Tin may be added. If any gold has been dissolved, it will cause a dark precipitate. The acid ought to be entirely dissipated by heat, without leaving any residue. Chloride of Barium gives no precipitate, if Sul.′ and Sulphates are not present, but the acid should be diluted before applying this test. Neither Ammonia nor its Sesquicarbonate throw down anything, showing the absence of metals and metallic oxides, that of Iron being precipitated in form of the Red Sesquioxide. Nitrous acid or binoxide of Nitrogen (*v.* Pereira) may be recognized by the Protosulphate of Iron.

Action. Uses. Corrosive poison; Escharotic.

Antidotes. Magnesia; solution of Soap, as easily procurable; the Bicarbonates of Soda and of Potash; Milk; Demulcents. Chalk to be avoided on account of the deleterious effects of Chloride of Calcium.

Acidum Hydrochloricum dilutum, L. Acidum Muriaticum dilutum. E. D. Diluted Hydrochloric or Muriatic Acid.

Prep. L. E. *Hydrochloric′* f℥iv. *Aq. dest* f℥xij. Mix. The L. acid has a Sp. Gr. of 1·043. A fluid ounce is saturated by 168 gr. of cryst. Sod. Carb. It contains 9 per cent. of the gas. The Sp. Gr. of the E. Acid=1·050. D. Similar. Sp. Gr. 1·045.

Action. Uses. Refrigerant; Tonic; externally as a stimulant lotion and gargle.

D. ♏x.—♏xx. in some bland or sweetened fluid or bitter infusion. f℈j. with ℥j. of Honey applied with a brush in ulcerated sore throat.

Inc. Alkalis, most Earths, Oxides, and their Carbonates; Sulphuret of Potassium; Tartrate of Potash; Potassio-Tartrate of Antimony; Nitrate of Silver; Acetate of Lead.

Acidum Nitromuriaticum, D.

Nitromuriatic Acid. *Acidum Nitrohydrochloricum. Aqua Regia. F.* Eau régale. *G.* Königswasser.

This acid is made by mixing Nitric′ with Muriatic′, and has probably been known since the discovery of these acids. The Arabs must have been acquainted with it, as they had a solvent for Gold.

Prop. Nitrohydrochloric′ is of a golden yellow colour, with the suffocating odour of Chlorine, and the irritant corrosive properties of the strong acids.

Prep. Mix pure *Nitric′* 1 part by measure, with pure *Muriatic′* 2 parts, in a green glass bottle, furnished with an accurately ground stopper, and keep in a cool place.

The resulting acid is not a mere mixture of the two acids, for both become decomposed. The Nitric′, which so readily parts with its Oxygen, gives 1 Equivalent which combines with the Hydrogen of the Hydrochloric′, and some water is thus formed. Of the Chlorine set free, some escapes, the rest remains in solution with the Nitrous acid formed; but an excess of either of the acids may remain, according to the proportions in which they are used. M. Gay Lussac considers Aqua Regia to be a combination of Nitric Oxide and Chlorine, in the proportion of 1 Equiv. of the former to 2 of the latter gas. When exposed to light, a portion of the water becomes decomposed, and Hydrochloric acid is again formed.

Tests. It is distinguished by the property of dissolving Gold, which is owing to the presence of Chlorine. Nitrate of Silver produces a precipitate of Chloride of Silver, which is soluble in Ammonia, but insoluble in Nitric′. When an Alkali is added, both a Chloride and a Nitrate are formed.

Action. Uses. Corrosive poison. When diluted, stimulant of the skin and of the liver. It is given internally in cases of lithic or oxalic deposit from the urine. A simple mineral acid would be inadmissible in both of these cases. The free Chlorine is probably the efficient ingredient.

D. ♏iij.—v. well diluted. Applied externally by sponging, or in a foot-bath of warm water, which is made of the acidity of vinegar, or in the proportion of f℥j.—f℥ij. of the acid to each gallon of water.

Carbon.

Carbonium. *F.* Charbon. *G.* Kohlenstoff.

Carbon (C=6) is very extensively diffused in nature, as in Coal, Anthracite, Graphite, &c.; of great purity, and crystallized in the form of the regular octohedron or cube, in the Diamond. It forms a large portion of both vegetable and animal substances. Combined with Oxygen, it exists in the Atmosphere and in many mineral waters as Carbonic acid gas, and as a Carbonate in immense quantities in Chalk, Marble, Limestone, &c.

Graphite, called also Plumbago and Black Lead, is found in primary mountains, and is nearly a pure form of Carbon. It has sometimes been considered a Carburet of Iron, but the presence of this metal is not essential; some specimens contain hardly a trace, and others as much as 5 per cent. of Iron. It is sometimes crystallized in six-sided prisms or tables, with a Sp. Gr. of nearly 2·5, opaque, steel-grey, solid, with a metallic lustre, soft to the touch, and well-known from its property of marking paper. The best specimens are obtained from Borrowdale in Cumberland.

Action. Uses. Graphite has long been employed in Medicine; internally for many of the same purposes as Charcoal, and externally as an ointment in some skin diseases.

Carbo Ligni, L. E. D. Wood Charcoal.

Prop. Charcoal is the form in which Carbon is usually seen. Its black colour and freedom from taste and smell are well known. It has never been decomposed, is insoluble, infusible, and unalterable. Sp. Gr. various. It is a bad conductor of heat, but an excellent one of electricity, and is remarkable for its power of counteracting putrefaction, and also for combining with and removing the odorous and colouring principles of most bodies. This is probably owing to its absorbing the odoriferous effluvia, as it does several of the gases, as Sulphuretted Hydrogen and Carbonic acid gas. Charcoal readily burns in air, emitting light and heat, combining with its Oxygen and forming Carbonic acid gas. It yields more heat than an equal quantity of wood, in consequence probably of being freed from the large proportion of water which wood contains. By the heating of coal in close vessels, Charcoal is obtained in the form of Coke.

Prep. Wood Charcoal is obtained by burning wood in covered-up heaps or in close vessels.

As the combustion takes place with only a limited supply of air, little of the Carbon of the wood is consumed, but its Oxygen, Hydrogen, and Nitrogen escape, variously combined. The charcoal

which remains necessarily contains the ashes of the plant, consisting of Carbonates of Potash, Lime, &c. (q. v.) Wood yields from 14 to 23 per cent. of Charcoal. A pure Charcoal may be obtained by burning Oils and Resins with a deficient supply of Oxygen, when, the volatile matters being dissipated, the charcoal is left, and commonly called *lamp-black.* For medical purposes either kind may be ignited in a close vessel to a red heat, until all volatile matters have escaped. The Charcoal is, when cool, kept in stoppered bottles.

Action. Uses. Antiseptic and Disinfectant; corrects the fœtor of the breath and of the stools in Dyspepsia and Dysentery.

D. Gr. x.—ʒj. internally; ʒj. or ʒij. to Lard ℥j. as ointment.

Cataplasma Carbonis, L. Mix finely powdered and freshly heated Charcoal with a Linseed poultice. Apply it warm to foul ulcers, to destroy the fœtor.

Carbo Animalis, E. D. Animal Charcoal. *Impure.*

This is obtained by subjecting bones, horns, muscles, &c., to a red heat in close vessels, until vapours cease to be emitted. The residue, after being powdered, is known by the names of *bone-black* and *ivory-black.* In this state it contains 88 per cent. of Phosphate of Lime (q.v.) and Carbonate of Lime, 2 per cent. of Carburet with Siliciuret of Iron, and a trace of a Sulphuret. It is bitterish in taste, and may readily be distinguished from Vegetable Charcoal by burning a little of it on a red-hot iron, when a large residue is left. The ashes, consisting chiefly of the Phosphate of Lime, are with difficulty acted on by Sulphuric Acid; those of Wood Charcoal, being composed of Carbonates, &c., dissolve, and form bitter solutions. Animal Charcoal is officinal on account of its attraction for the colouring matter of organic substances, a property probably owing to its extreme subdivision, and to the extent of surface which it exposes to any liquid filtered through it. The decolorizing power of Vegetable Charcoal may be increased by mixing Chalk or pounded flint with the vegetable matter previous to its being carbonized. Animal Charcoal is extensively employed in the arts for removing the colouring matter of Syrup, and also in the preparation of Citric and of Tartaric Acid, and of the vegetable Alkalis and their salts, as Quina, Morphia, Veratria. The same quantity of Charcoal may be used several times, but it requires to have been first dried and subjected to a red heat. It is either mixed or boiled with the liquid to be decolorized, or the latter is allowed to filter through a layer of Charcoal. For some purposes it requires to be purified.

Carbo Animalis (e Sanguine bovino igne præparatus), L. Carbo Animalis purificatus, E. D. Purified Animal Charcoal. Purified Ivory-Black.

Prep. A pure kind of charcoal may be obtained by the carbonization of bullock's blood by heat,—the product being well washed. The E. and D. direct

that common Ivory Black be digested for some time in dilute Muriatic Acid at a high temperature; then copiously washing with water, and finally drying it.

The H Cl dissolves the Phosphate and decomposes the Carbonate of Lime, as well as any Sulphuret, with the disengagement of Carb' gas and some Sulphuretted Hydrogen, Chloride of Calcium being left in solution. When the residuum has been thoroughly washed, it contains only a Carburet of Iron and some Silica mixed with the Charcoal.

Tests. It does not effervesce on the addition of Hydrochloric Acid (showing the absence of a Carbonate), nor is anything afterwards thrown down from this acid either by Ammonia or its Sesquicarbonate. If any Carbonate of Lime should have been present, a precipitate will be produced by the Sesquicarbonate. If Phosphate of Lime be dissolved by the H Cl it will be precipitated from the solution both by Ammonia and its Sesquicarbonate. The E. C. test it by incineration with its own volume of red Oxide of Mercury, when, if pure, it will be dissipated, leaving only a 200th of spongy ash.

Uses. Animal Charcoal is officinal for Pharmaceutical purposes. Animal Charcoal has been shown by Dr. Garrod to be a valuable remedy in many cases of poisoning, as if given immediately it absorbs and renders inoperative the most powerful alkaloids, and even Hydrocyanic Acid. About ½ an ounce is sufficient to neutralize each grain of Morphia or Strychnia. It is not so efficacious with the mineral poisons. (P. J. ix. 78).

Carbon and Oxygen.

Carbon and Oxygen form several compounds, which are important to be known on account of their properties, though all are not officinal. Carbonic oxide (C O=14), which is interesting as a compound radical, is a colourless gas, without taste or smell, but extremely poisonous when respired. Sp. Gr. ·972.

It is formed when Carbon is burned with a limited supply of Oxygen. Though it extinguishes burning bodies, it will itself burn with a pale blue flame, as may often be seen on the surface of a coal fire. It is also formed when charcoal is slowly burned, and is necessarily deleterious in close apartments. Professor Dumas states, that it is much more dangerous than Carbonic Acid, and that an admixture with the air of $\frac{1}{200}$th part will prove fatal. Fresh air and its forced inhalation, or that of Oxygen, will be the best remedies for this.

Oxalic acid is a compound of 2 Eq. Carbon with 3 Eq. Oxygen, and has been called Carbonous Acid. It might be treated of here, but being derived exclusively from organic sources, and closely resembling the other Vegetable Acids, will be considered along with them.

Acidium Carbonicum.

Carbonic Acid. *F.* Acide Carbonique. *G.* Kohlen säure. *Fixed Air. Aërial Acid. Spiritus lethalis. Choke-Damp.*

Carbonic Acid (C′ or C O_2=22), so named from being a compound of Carbon and Oxygen, has long been known from its effects; but its nature was not explained until 1757 by Dr. Black. It is abundantly diffused in nature, being a constituent of the atmosphere to the extent of $\frac{1}{1000}$th part. It issues from the earth in many situations, as the Grotto del Cane in Italy, and the Valley of Poison in Java; but especially in Germany, near the Lake of Laach, where Bischoff calculates that not less than 600,000 lbs. escape daily, and in such quantities in the Brohltahl as to enable him to employ it in some chemical operations. It issues also, combined with water, from many mineral springs, giving to them their sparkling brilliancy. It is by an excess of Carbonic Acid that the Carbonates of Lime, Magnesia, and Iron, are held in solution in different waters. It is formed in large quantities in the combustion of charcoal, &c., and during fermentation. It is always being exhaled by animals in the process of respiration, and in small quantities by plants at night or in the shade. Combined with bases, it exists in large quantities in the interior of the earth, and in the mountain masses of Marble, Limestone, Chalk, &c.

Prop. Carb′, at ordinary temperatures, exists as a colourless gas, of which the solution in water has an acid taste. It is very heavy: Sp. Gr. 1·52; 100 C. I. weigh 47·25 grs. Water dissolves its own volume, but may be made by pressure to take up a much larger quantity, when it will redden vegetable blues, but not permanently, as the acid escapes when exposed to the atmosphere. When subjected to great pressure, it has been reduced to a liquid state; and, by the effect of great cold, produced by its evaporation, it has been converted into a solid at —148° F. Carb′ gas extinguishes flame and all burning bodies, except Potassium: it is also fatal to animal life.

Prep. L. 1836. Under the head of Potassæ Bicarbonas, Carb′ was directed to be obtained from *Chalk* rubbed to powder and mixed with water to the consistence of a syrup, upon which *Sulphuric′* was then poured, diluted with an equal weight of water. It may also be obtained from coarsely powdered Marble, or any other carbonate, by the action of the diluted hydrochloric, or any other acid. Whenever the C′ is required for Therapeutical use, it is preferable to employ the S′, as not volatile.

Tests. Carbonic Acid may easily be detected by its evanescent action in reddening Litmus paper, by rendering Lime-water turbid, by precipitating Lime and Barytes from their solutions, and by these precipitates being soluble in Acetic Acid with effervescence.

Action. Uses. Acts as a stimulant when applied externally, or taken into the stomach, but is fatal to animal life when breathed. It may be prescribed in the forms of Liquor Potassæ effervescens,

Liquor Sodæ effervescens, and in all effervescing draughts, or as Carb′ water, or ordinary bottled Soda-water, which very often contains no alkali; or in some mineral waters, which are natural solutions of C′ in water usually containing also other impurities. Death has frequently occurred from breathing this gas in descending into cellars, wells, mines, &c. ; also from sleeping near brewers' vats, lime-kilns, in green-houses, or in small apartments or in cabins on board ship with a charcoal fire. It acts as a narcotic poison, and produces also a spasm of the glottis.

Hydrogen and Sulphur.

Acidum Hydrosulphuricum, L. Sulphuretted Hydrogen. Hydro-Sulphuric Acid. *Hydrothionic Acid. F.* Acide Hydro-Sulfurique. *G.* Schwefelwasserstoffsäure.

Hydrosulphuric acid (H S=17) is remarkable for its offensive odour and deleterious properties.

Prop. It is a colourless gas. 100 C. I. weigh 36 grs. Sp. Gr. =1·177. It has been reduced to a liquid form by a pressure of 17 atmospheres. It is inflammable ; Sulphurous acid and water being produced. Water absorbs about $2\frac{1}{2}$ times its own bulk, acquiring the taste and smell of the gas, as well as its acid property of reddening Litmus. On exposure to the air H S escapes, and the water becomes muddy from the deposition of Sulphur.

It combines with bases, and forms Hydrosulphates, as that of Ammonia; or Sulphurets, some of which, as those of Lead, Copper, Bismuth, and Silver, are blackish-coloured; that of Antimony, red; Zinc, white; Arsenic, yellow. Much useful information is obtained by employing H S or a soluble Hydrosulphate, as of Ammonia or of Potash, as a test, especially as it does not precipitate the Kaligenous and Terrigenous metals. Sulphuretted Hydrogen is absorbed in large quantities by Charcoal, is exhaled from putrefying animal matter, also from some vegetables, as the Cruciferæ, and likewise from decomposing vegetables generally, when a Sulphate is present,—from "the decomposition of the Sulphates in water by the Carbonaceous matter of vegetables,"* and from some mineral waters.

Prep. H S may be obtained by the action of *Sul′* 7 parts diluted with *Aq.* 32 parts, poured on *Sulphuret of Iron* 5 parts.

Action. Uses. Most deleterious when respired, even when much diluted. Mineral waters, either natural (as of Harrowgate) or artificial, taken internally, or used externally in the form of a bath, are stimulant, especially to the functions of the skin and of the uterine system. Hydrosulphate of Ammonia, D. is officinal. H S is also much used as a test, for which purpose it is included in the Appendix

* Professor Daniell on the Sulphuretted Hydrogen in the waters of the ocean. —Phil. Mag., July, 1841.

of the L. P. It should be freshly prepared. The gas should be passed first through the water in a washing-bottle to free it from accidental impurity, and then directly into the liquid to be tested. The Solution tested should first be rendered acid. When this is the case the Protosalts of Zinc, Iron, and Manganese, are not precipitated. Black or dark brown Precipitates are formed in solutions containing Copper, Lead, Tin, Mercury, Gold, Silver, and Bismuth ; white with persalts of Iron ; yellow with Arsenic ; and orange with Antimony. The earthy and alkaline bases are unaffected.

Antidotes. Inhalation of Chlorine, and Acids taken internally.

Hydrogen and Carbon.

Compounds of Hydrogen and Carbon are usually denominated Hydrocarbons. Of these, few are officinal, though we require to be acquainted with the properties of others, as they are deleterious. Thus, of those which are gaseous, the two following form the principal ingredient of Coal-gas.

Light Carburetted Hydrogen ($C\ H_2 = 8$). This gas is composed of 1 Eq. of Carbon and 2 of Hydrogen ; that is, it is a Bihydruret of Carbon. It may be seen escaping in bubbles from the surface of stagnant pools, and also in stirring up fœtid mud, being formed by the decomposition of vegetable matter. It issues sometimes in immense quantities from fissures in Coal-mines, and, mixing with the Oxygen of the Air, forms the fatally explosive *Inflammable Air or Fire-Damp* of Miners. It may also be produced artificially from the decomposition of Acetates. It burns with a yellow flame, and may be respired ; as Carb′ and Water are the results of its combustion, a deleterious atmosphere is necessarily produced.

Olefiant Gas ($C_2\ H_2 = 14$), named from forming an oily liquid by combining with Chlorine, is a gaseous compound of 2 Eq. of Carbon and 2 of Hydrogen. Like the former, this gas is found in Coal-mines, and may be made artificially by heating strong Alcohol with 5 or 6 times its weight of Oil of Vitriol. It is not respirable, extinguishes flame, but burns with a brilliant white light.

Petroleum, L. *F.* Petrole. *G.* Steinöl.

Other Hydrocarbons are either solid or liquid: of the latter, Petroleum or Rock Oil is officinal; and Naphtha, whether obtained artificially or as a product of nature, is often used medicinally. As these natural products are considered to be produced by fossil vegetable remains, and as the artificial products are obtained by the decomposition of vegetable matter, it will be convenient to treat of all of these nearly allied substances together. So also of Oil of Turpentine, Tar, and the products of the distillation of Coal. (*v.* Coniferæ.)

Creasoton, L. Creosote.

This has been so named from its property of preserving meat from decay: it is a compound of Carbon, Hydrogen, and Oxygen, and is hence described as an Oxy-Hydro-Carburetum in the L. P. As it is obtained from Tar, it will most fitly be treated of with that substance.

Carbon and Nitrogen.

These two elementary substances combine together, and form a very remarkable body, called Cyanogen, from κυανος, *blue*, it being a principal ingredient of Prussian Blue. (*v. Sesquiferrocyanide of Iron.*)

Cyanogen. *F.* Cyanogène.

Cyanogen (Cy or C_2 N = 26) may be obtained by heating Bicyanide of Mercury: it is a colourless gas, of a peculiar and pungent smell, like that of peach-kernels, burning with a purplish flame, readily absorbed by water, and condensible into a colourless liquid. But it is chiefly interesting as, though being a compound body, it acts like the simple elements in combining with metals, and forms with Hydrogen an acid, the Hydrocyanic, which is of fearful importance on account of its rapidly deleterious effects. As Cyanogen is the type of the compound *radicles* which present themselves in Organic Chemistry, and as Hydrocyanic acid is produced naturally by some plants, it will be treated of with Laurel Water under Amygdaleæ.

Ternary Compounds.

Ternary compounds abound in the Organic Kingdom, and many of them are officinal. But such compounds of Carbon, Oxygen, and Hydrogen, as Starch and Sugar, are most naturally treated of with the plants which yield them. Wines, Alcohol, and kindred bodies, connected with the Saccharine fermentation, being strictly neither inorganic nor organic substances, but products of the latter, will be treated of separately at the end of the work. Also Etherification, or the produce of the action of Acids on Alcohol, with the latter substance. Acetous Fermentation and the production of Vinegar are too closely allied to be separated from the consideration of Fermentation in general.

Vegetable Acids.

Having to notice the salts of these acids with the alkalis, earths, and metals, it would in some respects be preferable to treat of them here. But, as the account of each may be referred to, it is desirable to adhere to the plan adopted with the vegetable alkalis,—that of treating of the products with the Plants yielding them. Thus,

CITRIC ACID will be treated of with Citrus under AURANTIACEÆ.
TARTARIC ACID with Tartar under the Grape Vine in AMPELIDEÆ.
OXALIC ACID with OXALIDEÆ.
BENZOIC ACID with Benzoin under STYRACEÆ.
SUCCINIC ACID with Amber after the Resin of CONIFERÆ.
TANNIC ACID with Rhatanhy Root under KRAMERIACEÆ.

NITROGEN AND HYDROGEN.

AMMONIA. Volatile Alkali. *F.* Ammoniaque. *G.* Ammoniak.

Ammonia ($NH_3=17$) was probably known to Pliny, as he mentions the strong odour evolved from the mixture of Lime and *Nitrum.** The Hindoos also were acquainted with the Carbonate, and obtained it by mixing Sal Ammoniac 1 part and Chalk 2 parts. The name is derived from Sal Ammoniac, from which it was formerly obtained. The solution in water was known to the earlier Chemists, and called by them Volatile Alkali. It was first obtained as a Gas by Priestley. (Experiments on Different Kinds of Air, 1774.) In 1756, Dr. Black distinguished it from its Carbonate, though Berthollet was the first to communicate precise ideas respecting its composition, which was determined by Gay Lussac. Ammonia exists at all times in small quantities in the air, as Carbonate, (about $\frac{1}{100000}$th part), and therefore in rain-water, and is also contained in the juices of most plants, as the Birch, Beet-root, Sugar, &c. It is the chief source of the Nitrogen in plants, and is generally evolved during their decomposition. It is abundantly produced during the putrefaction of animal matter, and, in combination with Phosphoric′ and Hydrochloric′, exists in Urine. With heat and moisture, Urea (which is isomeric with Cyanate of Ammonia) is decomposed, Carbonate of Ammonia being formed. Some of its salts, as the Carbonate and Nitrate, are contained in mineral springs, as in those of Greiswolde and Kissengen; the Hydrochlorate and Sulphate (Mascagnin) are found in the neighbourhood of Volcanoes and near ignited Coal-seams. Dr. Austin ascertained that if nascent Hydrogen were presented to gaseous Nitrogen, Ammonia was formed. (Phil. Trans. vol. lxxvii. p. 379.) M. C. S. Collard has also some time since (Journ. de Chim. Méd. iii. 516) pointed out that this gas is formed during the contact of water and air wherever nascent Hydrogen and Nitrogen come in contact; and that thus it is produced daily in immense quantities, giving rise, it is supposed, by its further oxidation, to the Nitrates which stimulate Vegetable life. (*Dict. de Mat. Med.* Merat & De Lens, i. p. 255.)

Prop. Ammonia, when pure, is a colourless transparent gas, with a pungent suffocating odour, having alkaline and caustic properties. It

* Probably Sal Ammoniac, as several substances were included under *Nitrum.*

browns turmeric paper, and restores the blue colour of vegetables reddened by acids; but the effects are transient, from its volatility. It may be obtained by acting with caustic Lime or Potash on Hydrochlorate of Ammonia; or by heating a solution of Ammonia, and collecting the gas over Mercury. Its Sp. Gr. is 0·89. 100 C. I. weigh 18·28 grs. By a pressure of $5\frac{1}{2}$ atmospheres at 50° F. it was reduced by Faraday to the state of a colourless transparent liquid, with a Sp. Gr. of 0·76. Water absorbs it with very great rapidity, and to a great extent. (*v. Solution of Ammonia.*) Alcohol and Ether also readily dissolve it. Near any volatile acid, especially hydrochloric, it forms a white vapour. Combining with acids, salts are formed, some of which sublime when the acid is volatile; but, when this is fixed, the Ammonia volatilizes on the application of heat. It supports neither respiration nor combustion. A mixture of 2 volumes of Ammoniacal gas and $1\frac{1}{2}$ of Oxygen gas may be exploded by the electric spark. Nitrogen is produced, as well as water, proving the presence of Hydrogen. It is composed of 1 Eq. Nitrogen and 3 Eq. Hydrogen, or 1 volume of the former and 3 volumes of the latter compressed into 2 volumes.

If an amalgam of Mercury and Potassium be placed in a solution of Hydrochlorate of Ammonia, the Potassium is displaced, and the Mercury swells up to a great bulk, having combined with a supposed compound metal, Ammonium, $N\,H_4$. All the salts of Ammonia may be referred to Ammonium, and will then resemble those of Potassium. Thus Hydrochlorate of Ammonia is the same thing as Chloride of Ammonium.

$$N\,H_3,\,H\,Cl = N\,H_4,\,Cl.$$

The sulphate and others always contain 1 Eq. of water ; and thus

$$N\,H_3,\,S\,O_3 + H\,O = N\,H_4,\,O + S\,O_3.$$

Dr. Kane considers Ammonia to be a compound of Hydrogen with Amide, $N\,H_2$.

Action. Uses. A local irritant; fatal if respired. Diluted with air, a stimulant of the nasal and bronchial passages.

Antidotes. Inhaling vapours of hot Vinegar or fumes of H Cl.

Solution of Ammonia.

This is a solution of Ammonia in water. The L. and E. P. have both a strong and a weak solution.

Prop. Colourless like the gas, with a powerful pungent odour, and acrid alkaline taste. Its density, which is less than that of water, varies with its strength, and is less as the quantity of gas dissolved is greater. Sir H. Davy ascertained that, at 50° F. and ordinary pressure, water absorbs 670 times its own bulk of Ammoniacal gas, becoming of a Sp. Gr. = 0·875, when it contains 32·5 parts or about $\frac{1}{3}$ of gas. The lowest Sp. Gr. stated by Dalton is ·850. It freezes

about—40° F. Its boiling point differs according to its density, depending chiefly on the escape of gas. Like Lime-water, Solution of Ammonia absorbs Carbonic′ gas from the atmosphere, at the same time that much Ammonia escapes. It combines with acids to form salts; and with Oil it forms Soap, in some officinal liniments. It decomposes a great many earthy and metallic salts, precipitating their oxides, and in some cases redissolving them in an excess of Ammonia; or producing a double salt, as in Ammonio-Chloride of Mercury, Ammonio-Chloride of Iron, &c.

LIQUOR AMMONIÆ FORTIOR, L. D. Aqua Ammoniæ Fortior, E. Strong Solution of Ammonia.

As Solution of Ammonia is manufactured on a large scale by decomposing with caustic Lime the salts obtained from Gas liquor or from Bone spirit (*v. Ammoniæ Sesquicarbonas* and *Hydrochloras*), no formula is given for its preparation in the L. P., but it is to be of Sp. Gr. ·882 (E. ·880). As this is much stronger than ordinary solution of Ammonia, it may easily be reduced to the strength of Liquor Ammoniæ by adding to every f℥j. of it f℥ij. of water, by which the Sp. Gr. of the mixture will be 0·960.

The E. P. gives a formula for obtaining this and the Liquor Ammoniæ by one process: it is essentially the same as that of the D. P. for obtaining the latter, differing, however, in their being collected in two vessels: hence the solution is obtained of the two densities. The strong solution of the D. P. is made by passing Ammoniacal gas in sufficient quantity into the *Liquor Ammoniæ*, in a cooled vessel. It is much weaker than the L. and E. prep., having a Sp. Gr. of ·900. The Liq. Amm. Fort., L., contains 30 per cent. of the gas by weight.

Prep. E. Slake *Quicklime* ℥xiij. with *Aq.* f℥vij. ß. triturate it quickly with finely-powdered *Mur. Ammon.*, and put in a retort; connect this with a receiver containing *Aq. dest.* ℥iv., and this with another containing *Aq. dest.* ℥viij. These must be kept cold. Heat the retort as long as gas is evolved; remove it, and heat the first receiver. Should the liquor in the last bottle not have the density of ·960 (that ordered for the Aqua Ammoniæ), reduce it with that in the first, or raise it with *Aq. dest.* For details, *v.* E. P.

Action. Uses. Irritant, Vesicant and Caustic; often employed for *smelling* salts.

LIQUOR AMMONIÆ, L. D. Aqua Ammoniæ, E.

A weaker solution than the last may be made by diluting the last with 2 parts of water (L.), or by distilling Lime and Hydrochlorate of Ammonia (about equal parts) with water sufficient to slake the Lime, and passing the gas into water in a cooled receiver, as ordered in E. and D.

Here the Ammonia set free by the superior affinity of the Lime (Oxide of Calcium) distils over, but the Hydrochloric′ is decomposed;

its Chlorine combines with the Calcium of the Lime to form Chloride of Calcium, while the Oxygen of the Lime and the Hydrogen of the Acid being set free, combine and form 1 Eq. of Water, which remains in solution with the Chloride of Calcium. The Sp. Gr. of this solution of Ammonia ought to be 0·960 (·950, D.), and it is composed of nearly 10 parts of Ammonia and 90 of Water.

Tests. Odour, taste, and other properties, like the gas. By heat it evaporates in evanescent alkaline vapours, as shown by the transient browning of Turmeric paper. It gives no precipitate (Carbonate of Lime) with Lime-water, or with Chloride of Calcium, showing the absence of Carbonic′. It will not effervesce with dilute acids. When saturated with Nitric′, neither Sesquicarb. Ammonia nor Nitr. Silver throw down anything, proving that no earthy matter, nor H Cl, nor any Chloride, is present. Chloride of Barium gives no precipitate, showing the absence of Sulphuric acid. Being commonly prepared from gas liquor, solution of Ammonia is apt to contain tarry products, especially one called Pyrole. This is reddened on the addition of Sulphuric acid in excess. Oxalic′ will indicate the presence of Lime.

Inc. Acids, acidulous and most metallic salts.

Action. Uses. Antacid, Rubefacient, Stimulant, Antispasmodic, Diaphoretic.

D. ♏x.—♏xxx. in water, Camphor mixture, Milk, or any demulcent liquid.

Antidotes. Vinegar, Lemon-juice, or Vegetable Acids.

Off. Prep. Hydrargyri Ammonio-Chloridum. Lin. Camphoræ Comp. Lin. Hydrarg. Comp.

TINCTURA AMMONIÆ COMPOSITA, L.

Formerly the *Spiritus Ammoniæ succinatus,* intended as a substitute for *Eau de Luce*, but now contains no amber.

Prep. Macerate Mastich ℈ij. in Rectified Spirit f℥ix., and pour off the clear solution. Add Oil of Lavender ♏xiv., strong solution of Ammonia Oj., and shake them well together.

Action. Uses. Stimulant, Antispasmodic. In snake bites.

D. ♏v.—♏xx. in some bland liquid.

SPIRITUS AMMONIÆ, E.

This is a solution of pure Ammonia in Spirit, while the aromatic and fœtid spirits of the L. C. are compound solutions of the Carbonate of Ammonia in the same menstruum. In the old editions of the L. and D. Pharm. there was a formula for *Spiritus Ammoniæ*, containing also a Carbonate. This is now omitted.

Prep. The E. P. obtains the Ammonia by acting on *Muriate of Ammonia* ℥viij. with *Fresh Burnt Lime* ℥xij., first slaking the latter with *Aq.* f℥vj ß., then mixing together the two salts, and heating them in a retort, to which has been adapted a tube, which passes nearly to the bottom of a bottle containing *Rectified Spirit* Oij.

Here the Ammoniacal gas, as it passes over, is dissolved in the Spirit, and a preparation very similar to the Liquor Ammoniæ, and with a strong odour of the alkali, is obtained. Sp. Gr. ·845. It does not effervesce with weak Muriatic Acid. This preparation is employed for dissolving resinous and gummy-resinous substances, and volatile oils; for these the Caustic Spirit is the more active solvent.

SPIRITUS AMMONIÆ AROMATICUS, E. D.

Prep. E. Take *Spir. Ammoniæ* f℥ viij., *Volatile Oil of Lemons* fʒj., *Oil of Rosemary* fʒj ß. Dissolve the oils in the spirit by agitation. D. Similar.

D. ♏xv.—fʒj.

SPIRITUS AMMONIÆ FŒTIDUS, E. D.

Prep. E. Take *Spir. Ammoniæ* f℥ x ß., *Assafœtida* ℥ ß. Dissolve and distil. D. Similar.

D. ♏xv.—fʒj. *v.* ASSAFŒTIDA.

Both of these also contain pure Ammonia, instead of the Carbonate, which is contained in the London preparations.

As an external application, Ammonia may be applied in the form of the following Liniments or Ointment.

LINIMENTUM AMMONIÆ, L. E. D.

Prep. L. and E. Take of *Olive Oil* f℥ ij:, *Solution of Ammonia* f℥j. D. Half again as strong.

Rubefacient, Stimulant.

LINIMENTUM AMMONIÆ COMPOSITUM, E. Compound Liniment of Ammonia.

Prep. Take of Stronger Solution of *Ammonia*, density ·880, f℥v., *Tinct. of Camphor* f℥ij., *Spirit of Rosemary* f℥j. Mix them well together. This liniment may also be made weaker, for some purposes, with *Tincture of Camphor* f℥iij., and *Spirit of Rosemary* f℥ij.

Rubefacient, Vesicant, or Cauterizing.

Ammoniacal Ointment. This is formed by rubbing up Ammonia with fatty matter in proportions according to the effect required. If rubbed on the skin, and the Ammonia allowed to evaporate, rubefaction will be produced, but if confined by a compress, vesication will ensue.

CARBONATES OF AMMONIA.

From the difficulty of distinguishing in the description of old authors the several Carbonates of Ammonia, it is preferable to treat the little that is known of their history, together. We have seen that Carbonate of Ammonia is always present in the atmosphere. It is disengaged from decomposing animal remains, and is found in some

springs, as well as in the juices of plants. The Hindoos would seem to be acquainted with it, as they have a formula, given by Dr. Ainslie, in which they heat together 1 part Sal Ammoniac and 2 parts of Chalk, which must produce a Carbonate of Ammonia. It was probably also, as inferred by Dr. Pereira, known to the Arabs. Raymond Lully was acquainted with the impure solution of Carbonate of Ammonia obtained from putrid Urine, and Basil Valentine mentions the Spiritus salis Urinæ.

Three Carbonates of Ammonia are included among the preparations of the British Pharmacopœias: the simple Carbonate in a liquid form in the Spiritus Ammoniæ Aromaticus and Fœtidus; the Sesquicarbonate as a solid salt; and the Bicarbonate of Ammonia, D., may also often be found effloresced on the latter.

CARBONATE OF AMMONIA. *F.* Carbonate d'Ammoniaque.

The Carbonate of Ammonia, which consists of 1 Eq. Ammonia, 17+1 Eq. Carbonic Acid, 22=39, and, if hydrated, of an additional Eq. of Water, 9+39=48, may be formed by bringing C′ gas in contact with Ammoniacal gas; or by decomposing Hydrochlorate of Ammonia by the Alkaline or Earthy Carbonates, and distilling along with some liquid; or it may by slow evaporation be obtained in a crystalline state.

SPIRITUS AMMONIÆ AROMATICUS, L. Spirit of Sal Volatile.

Prop. It is a colourless, pleasantly fragrant, and agreeably stimulant solution of volatile oils in Ammoniated Alcohol. Sp. Gr. 0·918. It becomes brown by keeping.

Prep. L. Mix together *Hydrochlorate of Ammonia* ℥vj., *Carbonate of Potash* ℥x., *Bruised Cinnamon* ʒij ß., *Cloves* ʒij ß., *Lemon Peel* ℥v., *Rectified Spirit* and *Aq. dest.* of each Oiv., and distil 6 pints.

A double decomposition occurs; by this the neutral Carbonate of Ammonia is produced along with Chloride of Potassium, while the Hydrogen of the Hydrochloric′ unites with the Oxygen of the Potash to form an equivalent of water. The Carbonate of Ammonia distils over along with the spirit, water, and essential oils.

D. ♏xv.—lx. May be prescribed with Sulphate of Magnesia.

SPIRITUS AMMONIÆ FŒTIDUS, L.

This is prepared as the last, with the addition of Assafœtida, instead of Aromatics.

It is a solution of the Volatile Oil of Assafœtida in Ammoniated Alcohol. An efficient substitute may be made by adding Tinct. of Assafœtida to Spirit of Ammonia.

Action. Uses. Stimulant, Antispasmodic.

D. fʒß—fʒj.

AMMONIÆ SESQUICARBONAS, L. D. Ammoniæ Carbonas, E. *Sal Volatile. Ammonia Præparata. Ammoniæ Subcarbonas.*

The Sesquicarbonate ($2\,NH_3+3\,CO_2+2HO=118$), often called Subcarbonate, or simply Carbonate of Ammonia, has long been known by various names, as *Volatile* or *Smelling Salts*, *Salt of Hartshorn*, *Volatile Salt of Urine*, all of which indicate either its properties, or the sources from whence it was obtained. It is now obtained by the action of the Alkaline or Earthy Carbonates on Hydrochlorate of Ammonia, or sometimes on crude Sulphate of Ammonia.

Prop. Usually met with in colourless translucent cakes; fracture striated, or of a rather fibrous texture; taste sharp, alkaline, ammoniacal; odour pungent, penetrating. On exposure to the air, it loses its translucency, becomes friable, and covered with a white powder, Bicarbonate of Ammonia, which is much less pungent, and is called *Mild Carbonate of Ammonia.* This is formed from the escape of a portion of the Ammoniacal gas, or of Carbonate of Ammonia, as is indicated by the discoloration of Turmeric paper held over it. This salt is completely dissipated by heat; is soluble in less than 4 times (twice, Berz.) its weight of cold water, but in boiling water it is decomposed with the evolution both of Carb′ and of Ammonia; soluble also in proof, but sparingly so in rectified Spirit. The composition of this salt, according to Mr. Phillips, is

3 Eqs. of Carbonic Acid	$22\times3=66$	or Carb′	55·93
2 Eqs. of Ammonia	$17\times2=34$	,, Ammonia	28·81
2 Eqs. of Water	$9\times2=18$	,, Water	15·26
	118		100

But, as observed by Dr. Pereira,—from the observations of Dalton and Scanlan, this is not a single salt or Sesquicarbonate, but a mixture or compound of the Carbonate and Bicarbonate; for, if treated with a small quantity of cold water, a solution of Carbonate of Ammonia is obtained, while a mass of Bicarbonate remains, having the form and dimensions of the Sesquicarbonate employed. From the uniformity of its composition and its crystalline structure, Dr. P. considers it to be a chemical combination of two salts. 1 Eq. Anhydrous Carb. Ammonia 39+1 Eq. Hydrated Bicarb. Ammonia 79=118 Hydrated Sesquicarbonate Ammonia. According to the most recent view, this salt is a compound of 3 Eq. C′+2 Eq. Oxide of Ammonium.

Prep. E Take of *Hydrochlorate of Ammonia* ℔j. and of *Chalk* ℔j ß. Rub them separately into powder. Mix and sublime with a heat gradually raised.

Here a mutual decomposition takes place between the Carbonate of Lime (Chalk), and Hydrochlorate of Ammonia. They exchange acids. On the one hand, Carbonate of Ammonia is formed; on the other hand, from H Cl and Lime (Ca O), Chloride of Calcium and

water are produced (Ca Cl+H O). Ca Cl remains in the retort. The Carbonate of Ammonia and the water distil over together. So far all is simple; but a further change takes place. Instead of a simple Hydrated Protocarbonate, the product is a Sesquicarbonate with 2 Eq. of water. From every 3 Eq. of the former, 1 Eq. of Ammonia and 1 of water escape during sublimation. The change may be thus shown by an equation,—

$$3\,(N\,H_3, C\,O_2, H\,O) = (2\,N\,H_3, 3\,C\,O_2, 2\,H\,O) + N\,H_3 + H\,O.$$

When exposed to the air it loses an equivalent of the Carbonate of Ammonia, and a Bicarbonate ($N\,H_3$, $2\,C\,O_2$, $2\,H\,O$) remains.

Sesquicarbonate of Ammonia is sometimes made on a large scale by subliming a mixture of impure Sulph. Ammonia and Carb. Lime. The result is as above, Sulph. Lime being left. The Sulphate of Ammonia being obtained by acting with S′ or Sulph. Lime on the impure Carb. Ammonia of *Gas Liquor*, or that from *Bone Spirit.* It is necessarily impure, and often contaminated with tar or oily matter, and therefore requires to be refined.

Tests. The salts of Ammonia may be easily recognized by its fumes, which are exhaled when they are rubbed up with Potash. In this salt the odour and tests will at once reveal that alkali, and the Carb′ is known by effervescence with dilute acids. It yields a white precipitate with the Chloride of Calcium or of Barium ; the clear liquor from which the latter precipitate (Carbonate of Barytes) has subsided, yields a further precipitate on the addition of Caustic Ammonia. By this last character the Sesquicarbonate is distinguished from the neutral Carbonate. (Per.) This may be explained by considering its compound nature. The Bicarbonate does not precipitate the earthy bases, but the addition of Ammonia converts it into a neutral carbonate. Carb. Ammon. is not very liable to be impure when prepared by the first process. It is translucent in mass, but falls to powder in the air ; entirely sublimed and soluble; changes the colour of turmeric ; when saturated with Nitric′, it does not precipitate with Chlor. Barium, or with Nitr. Silver. If the translucency be impaired, and the salt looks white and powdery, a portion has been converted into the Bicarbonate, a less pungent salt. Anything insoluble or not sublimed is an impurity. The presence of Sulphates, as of Ammonia, will be indicated by the Barytic salts; and any Hydrochlorate of Ammonia, by a white precipitate being formed by Nitrate of Silver.

Action. Uses. Antacid, Stimulant, Antispasmodic, Diaphoretic.

D. gr. ij.—gr. x. in pills, or in solution, as below.

Inc. Acids, Aciduous Salts, Alkalis, Lime-water, Magnesia; many Metallic salts, but not the Potassio-Tartrate, or Ammonio-Citrate of Iron, or Sulphate of Magnesia.

Liquor Ammoniæ Sesquicarbonatis, L. Aqua Ammoniæ Carbonatis, E.

Prep. Dissolve *Sesquicarbonate of Ammonia* ℥iv. in *Aq. dest.* Oj. Filter.

This solution has the odour and other properties of the salt, and like it is liable to change when exposed to the air, becoming less pungent. It may be employed for all the purposes of this salt, or for those of the Liquor Ammoniæ, but is less pungent, and will evolve C′.

The Sesquicarbonate of Ammonia is sometimes employed for making effervescing draughts.

℈j. Sesquicarbonate of Ammonia saturates	fʒvj. of Lemon Juice 24 grs. of cryst. Citric acid	forming Citrate of Ammonia.
	25 grs. of cryst. Tartaric acid	forming Tartrate of Ammonia.

Action. Uses. Rubefacient, Stimulant, &c. Useful as a Test. Useful in allaying nausea and vomiting; also slightly diaphoretic.

D. fʒß or even fʒij. if duly diluted.

Linimentum Ammoniæ Sesquicarbonatis, L. Liniment of Sesquicarbonate of Ammonia.

Prep. Shake together *Sol. of Sesquicarbonate of Ammonia* f℥j., *Olive Oil* f℥iij., until they are well mixed.

The Ammonia, by combining with the Oil, forms a kind of Soap, of which the union is imperfect, in consequence of the Carbonate being employed. It is a milder preparation, and may be used for the same purposes as the Linimentum Ammoniæ. A similar preparation may be prepared by rubbing up some of the powdered salt with Lard.

Ammoniæ Bicarbonas, D. Bicarbonate of Ammonia.

The Bicarbonate (NH_3, $2\,CO_2$, $2\,HO$), is formed whenever the Sesquicarbonate is exposed to the atmosphere, or even when the bottle in which it is kept is frequently opened. It is sometimes called *Mild Carbonate of Ammonia*, from the Ammoniacal odour and taste being less obvious from combination with a further Eq. Carb′. It crystallizes usually in 6-sided prisms, and requires 8 parts of water for solution.

This salt is composed of 2 Eq. C′ 44+1 Eq. A. 17+2 Eq. Aq. 18 =79; or, per cent. C′ 55·70+A. 21·52+Aq. 22·78 = 100; or it may be considered as an anhydrous compound of 2 Eq. C′ and 1 of oxide of Ammonium.

Prep. Expose on a sheet of paper for twenty-four hours, any quantity of the *commercial Sesquicarbonate* well powdered. Enclose it now in a well-stoppered bottle. A carbonate evaporates, a bicarbonate remains.

Tests. Its solution at first occasions no precipitate with Chlor. Barium or Chlor. Calcium: after a short time, however, the mixture evolves Carb′, and a white earthy Carbonate is precipitated. But it does not precipitate Sulphate of Magnesia.

Action. Uses. Antacid, Diaphoretic. Being milder, it may be more suitable than the Sesquicarbonate in some cases.

D. gr. v. to gr. xx. in *cold* water. For effervescing Draughts ℈j. will saturate 18 grs. of Cit′. or 19 grs. of Tar′.

Liquor Ammoniæ Acetatis, L. D., Aqua, E. *Spirit of Mindererus.*

Acetate of Ammonia (NH_3 Ac′+H O = 77) may be obtained in crystals in the exhausted receiver of an air-pump; but as it is a deliquescent salt, it is contained in the Pharmacopœias only in the state of a diluted solution.

Prop. This is limpid, colourless, with a faint smell, and a slight mawkish taste. If neutral, it should produce no effect on Litmus or Turmeric paper, though it is preferable to have a slight excess of acid, as it will be less irritant when used as a lotion in some cases; but the excess of alkali may sometimes be no objection when exhibited internally.

Prep. L. Add to dilute *Acetic Acid* Oj., *Sesquicarbonate of Ammonia* ℥ix. or q. s. to saturation.
E. D. Similar: much weaker.

The CO_2 escapes with effervescence, and a neutral solution should be formed. The strength of the L. preparation is 1·022, that of the D. 1·012. The Ed. solution resembles the last, being of Sp. Gr. 1·011. The E. P. makes use of distilled Vinegar, of a density 1·005. On the Continent some of the solutions are of greater strength. The original Spirit of Mindererus was formed by saturating strong vinegar with Spirit of Hartshorn; it was thus a solution of Acetate of Ammonia, with some Ammoniacal Soap formed by the action of the alkali on the empyreumatic oil of the spirit, which, M. Chaussier observes, added to its efficacy. Acid of the proper strength should alone be employed, and not, as is often the case, impure Acetic Acid diluted.

Tests. Action on Litmus or Turmeric paper will detect excess of acid or alkali. It is not coloured by the addition of Hydrosul′., showing the absence of any metallic oxide, especially Copper or Lead; no precipitate on addition of Nitr. Silver or Chlor. Barium, the first indicating absence of Hydrochloric′, and the second of Sulph′. The water being evaporated, the residue yields Ammonia, and is dissipated by heat; any further residue is an impurity, as both the Acetic′ and the Am. are volatile. The most usual irregularity is in point of strength, and this should be ascertained by the Sp. Gr.

Inc. Decomposed by the strong acids; also by Potash and Soda, and by their Carbonates; by Lime and Lime-water, Magnesia and

Sulphate of Magnesia, the Acetate and Diacetate of Lead, (on account of the Carbonic′ which often remains diffused in the solution, and which then precipitates Carb. of Lead); also several other metallic salts, as of Antimony, the Sesquichloride and Sulphate of Iron, &c.

Action. Uses. Stimulant, Diaphoretic ; Refrigerant Lotion and Collyrium.

D. f℥ij.—f℥vj. every 3 or 4 hours, with Camphor mixture, &c.

Liquor Ammoniæ Citratis, L.

The Citrate of Ammonia is a neutral Tribasic Salt ($3\ NH_3$ Cit′.=216), the Citric being a Tribasic acid. It cannot be obtained in the solid state, as the solution, when evaporated, loses Ammonia. The solution is made like that of the Acetate.

Prep. Dissolve *Cit. Acid* ℥iij. in *Dist. Water* Oj., and add of *Sesquicarb. Ammonia* ℥iiß. or q. s. to saturation.

The tests are those of Ammonia and Citric Acid, q. v. The solution should contain no Tartaric Acid.

Uses. For a Diaphoretic and Refrigerant draught in fevers, &c.

Ammoniæ Hydrochloras, L. Murias, E. D.

Hydrochlorate of Ammonia. *Sal Ammoniac.* *F.* Hydrochlorate d'Ammoniaque. *G.* Salmiak.

This salt ($NH_3\ HCl$=54) was known to Geber. Avicenna and Serapion mention it by the name *Noshadur.* Persian writers give *Armeena* as its Greek synonyme. The Sanscrit name is *Nuosadur ;* the Author obtained it by this name in India, where it is formed in brick-kilns. (*v.* Hindoo Med. p. 40.) In Egypt it is obtained from the dung of camels. That it was known to the Romans, is evident from Pliny stating that one of the kinds of *Nitrum* gives out a strong smell when mixed with Quicklime.

Prop. It is usually in pieces of hemispherical cakes, of a white colour, without smell, having a saline acrid taste. Its texture is striated and radiated; it is somewhat tough and ductile, opaque or crystalline and semi-transparent ; nearly permanent in the air, but attracts a little moisture; some impure varieties, crystallized in conical masses, are deliquescent, from containing Chloride of Calcium. Sp.Gr. 1·450. It is soluble in about its own weight of boiling water, but requires $3\frac{1}{4}$ times as much at 60°, when it produces considerable cold; hence it is one of the salts most commonly employed in freezing mixtures. It requires about 5 parts of Alcohol, but less of rectified Spirit, for solution; when heated, it sublimes without decomposition, and is thus most frequently obtained. When its solution in boiling

water is cooled down, it crystallizes in tetrahedral prisms terminated by 4 planes, in octohedrons, or in plumose crystals; the latter are formed "of rows of minute octohedrons, attached by their extremities." (*g*.)

This salt is decomposed by acids and alkalis, the S′ and N′ combining with its Ammonia and setting free the H Cl; while Potash, Soda, Baryta, Lime, and Magnesia, set free its Ammonia, which may be recognized by its tests, and unite with the acid forming chlorides; — their Carbonates likewise decompose it, forming Carbonates of Ammonia. With Nitr. Silver a white precipitate soluble in Ammonia (Chloride of Silver) is formed, and with Acet. Lead one of Chloride Lead, also white. With Bichloride of Platinum, a yellow precipitate (Platino-bichloride of Ammonium), which, when collected, dried, and ignited, yields spongy Platinum. It increases the solubility of Bichloride of Mercury, and forms an ingredient in the Liquor Hydrargyri Bichloridi.

Hydrochlorate of Ammonia is composed of Hydrochloric acid 31·48, Ammonia, 68·52=100.

By those chemists who admit the hypothetical metal Ammonium, this salt is termed Chloride or Protochloride of Ammonium. Dr. Kane considers it a Chloro-amidide of Hydrogen.

Hydrochlorate of Ammonia may readily be formed by bringing together Ammonia and H Cl gases; and these probably come together in volcanoes, and account for the salt being there found. In Egypt it is yielded by the soot produced by burning the dung of camels and of other animals which feed on the saline plants of the desert. So in N. W. India it is obtained at the unburnt extremity of brick-kilns, where animal manure and refuse straw, &c. are employed as fuel. It is now obtained from the destructive distillation of bone, as animal Charcoal is required for the use of Sugar-refiners, the fat and marrow being first removed for the use of Soap-makers. The gelatinous and cartilaginous parts become decomposed, the Nitrogen and Hydrogen form Ammonia, and the Carbon with Oxygen some Carb′., which unites with the Ammonia. This Carbonate of Ammonia, received and consequently dissolved in water, is called *Bone Spirit.* The Carbonate is also obtained in the preparation of Coal Gas, which, being passed through water, forms *Ammoniacal* or *Gas Liquor.* Other salts are also formed. To these H Cl is sometimes added, and an impure Hydrochlorate of Ammonia obtained, which may be purified by crystallization and sublimation. By other manufacturers (*v.* Per. i. p. 445) an impure Chloride of Calcium, obtained from Salt-works, is added to the Ammoniacal liquor, when a precipitate of Carbonate of Lime is obtained, and, as before, Hydrochlorate of Ammonia in solution; in either case it may be separated and dried by evaporation, and then purified by sublimation. Or these Carbonates may be converted by the addition of Sulph. Acid into Sulphate of Ammonia, and mixed with Chloride of Sodium. On application of

heat, double decomposition ensues, Hydrochlor. Ammonia is formed, and, being volatile, is obtained pure by sublimation; Sulphate of Soda remains behind.

Tests. Sal Ammoniac, as found in nature, is sometimes mixed with Chlor. Calcium, the old Muriate of Lime. This is ascertained by its greater deliquescence, and by the tests for that earth. From the mode of its manufacture, it sometimes contains Iron or Lead. These would be revealed by its not being totally soluble in water, and not being sublimed by heat without residue. It should be colourless and translucent; Chloride of Barium throws down nothing, showing absence of Sulphate of Ammonia. The Lead is usually seen on the discoloured convex surface, when it has been sublimed into a leaden vessel, probably a double Chloride of Lead and Ammonium. A solution of this salt gives a black precipitate (Sulphuret of Lead) when Hydrosulphuric acid gas is passed through it. (Jackson, Med. Gaz. 1839, as quoted by Per.) Iron may be detected by Ferrocyanide of Potassium and a few drops of Nitric′. It is derived from the pot from which the sublimation is conducted.

Action. Uses. Moderately Stimulant, Irritant, Diaphoretic; Refrigerant as a lotion, on account of the cold produced in solution; Discutient; sometimes Anodyne in Neuralgic affections.

D. gr. v.—gr. xxx. 2 or 3 times a day, with Sugar and Aromatics. As a cold application, equal parts of Nitre and Sal Ammoniac may be employed. ℥ij. with Nitre ℥v. will reduce temperature 40°.

Inc. Stron acids; Potash, Soda, Lime, their Carb.; Acet. Lead.

AMMONIÆ OXALAS, L. (Crystalli.)

Oxalate of Ammonia, in crystals, is contained in the appendix of the L. P. ($NH_3, C_2O_3, HO=62$). Oxalic acid (C_2O_3) is obtained by oxidizing Sugar or Starch by means of Nitric′. This salt is obtained by neutralizing with the acid a solution of Sesquicarbonate of Ammonia, and then evaporating, that crystals may be formed.

The solution is used as a delicate test for Lime, and is thus employed in ascertaining the purity of water.

The solution to be tested should be first carefully neutralized with Ammonia, and a small quantity of a solution of Hydrochlor. Ammonia added. Then, on the addition of the oxalate, a white precipitate will form if any Lime is present, but solutions containing Magnesia will be unaffected.

AMMONIÆ HYDROSULPHURETUM, D. Hydrosulphuret (Hydrosulphate) of Ammonia. ($NH_3, HS=34$). A solution of Liquor Ammoniæ is saturated with a steam of Sulphuretted Hydrogen gas. The solution thus prepared has a Sp. Gr. ·999.

It is used as a test. It precipitates from a neutral solution those metallic bases which are not precipitated by H S′ from an acid solu-

tion, (vide H S). Protosalts of Iron, Cobalt, and Nickel, are precipitated black; of Zinc and Aluminum, white ; of Manganese, pink ; sesqui-salts of Chromium, greenish ; the earthy and alkaline bases, except Alumina, are unaffected.

METALS.

Metals may be divided into those which by union with Oxygen form 1. ALKALIS, such as Potassium and Sodium; 2. ALKALINE EARTHS, Barium, Calcium, Magnesium, Aluminum ; 3. METALS commonly so called, or which form METALLIC OXIDES.

ALKALINE METALS.

POTASSIUM.

F. Potassium. *G.* Kalium and Kali metall.

Potassium (K=40) is the metallic base of Potassa, or Potash, the Oxide of Potassium. In this state it exists in nature in abundance, combined with Acids and Earths, Iodine, Bromine, &c.; but it is obtained chiefly from the vegetable kingdom. It was the first of the metallic bases obtained by Sir H. Davy; being produced by galvanizing Caustic Potash very slightly moistened, when the metal in small globules appeared at the negative pole. It is now commonly obtained by exposing Potash to intense heat with Iron filings or Charcoal, which take its Oxygen, by which the Potassium is set free.

Prop. Potassium at 55° F., is a soft malleable solid. It has been crystallized in cubes, is brittle at 32°, and fuses at 156°; at 60° F. its Sp. G.=0·86 ; it is therefore light enough to float on water. It is silvery-white, but immediately tarnishes when exposed to air, from its great affinity for Oxygen, which it will take also from water, swimming and burning upon it with great brilliancy, and being converted into Potash, while the Hydrogen escapes. It is preserved in fluids, such as Petroleum and Naphtha, which contain no Oxygen, as it is one of the most powerful deoxidizing agents known.

POTASSÆ HYDRAS, L. Potassa, E. Potassa Caustica, D. Oxide of Potassium. Potash. *Potassa fusa. Kali purum. Fixed Vegetable Alkali. F.* Potasse caustique. *G.* Kali.

Potassa (K O=48) is a compound of Oxygen and the metal Potassium. The name Potassa was derived from the commercial name Potash, which is applied to a Carbonate of Potassa. Dr. Black in 1756 first clearly distinguished the Carbonate from the caustic alkali. This he called Lixivia, from the name in Pliny, but it was named *Kali* by the L. C. The ancients were no doubt acquainted with

some method of depriving the alkali of its Carbonic acid, as they were skilled in the art of making soap. (Pliny, xxviii. c. 51.)

From the affinity of Potassium for Oxygen, the Oxide or Potash is readily formed by exposing the metal to dry air or to Oxygen gas. Some of it may also be found in the gun-barrel which is commonly used in the process of making Potassium. But it has so great an attraction for water, that it readily absorbs it from the air, and is therefore usually seen in this, which is the officinal state, as Potassæ Hydras, K O, H O = 57.

Prop. Caustic Potash, when fused and pure, is whitish, in solid, slightly crystalline masses, sometimes in tetrahedral pyramids or octohedrons; hard and brittle; Sp. Gr. 1·70; usually cast in cylindrical pieces or sticks, of a grayish colour, of an intensely caustic taste, with little smell. When moistened, it has a soapy feel, due to its power of dissolving the cuticle. It readily attracts moisture, and at the same time Carb′ from the atmosphere. It is soluble in water, producing heat when in a fused state, but some cold when crystallized; also in alcohol, with the exception of impurities. Hence it may be separated from its Carbonates, as these are insoluble in Alcohol. It liquefies ice, with the production of intense cold; is not decomposed by the most intense heat, but fuses below a red heat, and at a bright red heat evaporates in white acrid fumes. It turns green the blue colour of vegetables, but afterwards destroys them, as well as other organic substances, by abstracting from them the elements of water. Thus its caustic power depends on its affinity for water. It possesses highly alkaline properties, uniting with fixed Oils and Fats to form soaps, and with acids to form salts. It combines with considerable energy with Phosphorus and with Sulphur; when fused with Siliceous Earth, it forms Glass; and when in larger proportion, a Silicate of Potash soluble in water. With other earths it forms enamels, and even when in solution dissolves Alumina and Glucina. Its salts are soluble in water, and generally crystallizable; when added to a solution of Sulphate of Alumina, they cause the formation of Alum in crystals. Tartaric′, if added in excess, produces a precipitation of Cream of Tartar, or Bitartrate of Potash; while Chloride of Platinum throws down a reddish-yellow precipitate of Chloride of Platinum and Potassium; the salts of Potash, moreover, give a violet tinge to flame, and may by these characters be distinguished from the salts of Soda.

The common method of obtaining it is to decompose one of the most commonly obtained of the salts of Potassa, that is, the Carbonate, by means of Lime, and then to evaporate the solution to dryness.

Prep. L. Take *Solution of Potash* cong. j., evaporate in a clean Iron vessel, till ebullition ceases, and only the fused Hydrate of Potash is left. Pour into proper moulds.

E. Similar: the liquid, as soon as it hardens on a glass rod dipped into it, is poured on to an iron plate, and broken up when cool. D. Similar to E.

The solution of Potash employed should be itself pure, and so preserved as not to have attracted Carb′ from the air; while the ebullition and temperature

are kept up, no Carb′ is absorbed. A clean iron vessel is sufficient, but the contact of all organic substances must be prevented.

Tests. The L. P. states that it soon deliquesces, and is entirely soluble in alcohol; but this last will seldom be found to be the case. The other properties are the same as those of Liquor Potassæ. Some impurities are allowed by the E. P. "Boiling water commonly leaves Oxide of Iron undissolved, which should not exceed 1·25 per cent. The solution neutralized with Nitr′ (and it should not effervesce) gives a faint precipitate with a solution of Nitrate of Baryta (indicating a Sulphate), none with the solution of Nitrate of Silver." E. P.

Action. Uses. Escharotic, Caustic Poison, Antacid. v. *Liquor Potassæ.*

POTASSA CUM CALCE, L. E. D. Potash with Lime.

Hydrate of Potash being chiefly employed as a Caustic, and being objectionable on account of its deliquescence, this preparation is often preferred, as the presence of Lime obviates the inconvenience.

Prep. L. D. Take *Hydrate of Potash* ℥j., *Lime* ℥j.; rub together, and keep in a well-closed vessel.

E. *Aq. Potassæ* is evaporated to ⅓rd of its bulk, and slaked *Lime* added until a fine pulp is produced.

When mixed with water it is slaked, and when an acid is added, no bubbles of $C\,O_2$ should be evolved. L.

Action. Uses. Caustic; made into a paste with Rectified Spirit, and applied, the neighbouring parts being defended with sticking-plaster.

LIQUOR POTASSÆ, L. Aqua Potassæ, E. Liquor Potassæ Causticæ, D.

Prep. L. Take *Carb. Potash* ℥xv., *Lime* ℥viij., *Aq. dest.* boiling conj. j. Dissolve the Carb. Pot. in C. ss of the Aq. Slake the Lime with a little water in an earthen vessel, and then add the remainder of the water. Mix the liquors in a close vessel, and agitate till they are cold. Set it aside for the Carb. Lime to settle, pour off the supernatant liquor, and keep it in a well-stoppered green glass bottle.

E. D. Similar: solutions rather stronger than L. (E. Sp. Gr. 1·072. D. 1·068.) The solution of the Carbonate is also boiled, and the Milk of Lime added during ebullition.

The Lime, having a strong affinity for Carb′, unites with that of the Carb. Pot.; the insoluble Carb. of Lime being precipitated, the free Potash remains in solution. Filters are not employed, because the Potash destroys all organic matter, and the process is tedious. The solution should be as little as possible exposed to the air, as it absorbs Carb′. The purity will depend upon the Carbonate of Potash and Lime, as well as upon that of the water employed. Dr. Christison states that decomposition of the Carb. is accelerated by ebullition.

Prop. Solution of Potash is colourless, transparent, somewhat oily-looking, without odour, but of an extremely acrid, caustic taste. The quantity of real Potash in solutions of different Sp. Gr. was ascertained by Dalton. 100 grains of the L. solution contain about 6·7 grains of potash. It feels soapy when rubbed between the fingers, is highly alkaline, rapidly absorbs Carb′ from the air, must therefore be kept in well-stoppered green glass bottles, because it acts on those made of flint glass. It forms soaps with oils and fats, and powerfully decomposes many salts, as those of Ammonia, and of the Earths and Metals, throwing down their oxides from a solution, some of which oxides it redissolves when added in excess. It corrodes both animal and vegetable textures, and precipitates from vegetable infusions any alkalies or neutral principles, itself combining with their acids.

Tests. Sp. Gr. 1·063 (L. P.) browns Turmeric, and, like other salts of Potash, throws down a yellow precipitate with Chloride of Platinum, which is insoluble in Spirit. It should not effervesce with N′, or become milky on the addition of Lime-water, which would show the presence of Carb′. When saturated with N′, scarcely anything should be precipitated by Carbonate of Soda (showing that no Lime or metallic impurity is present), nor with Chlor. Barium (no Sulphates), nor with Nitr. Silver (no Chlorides).

Inc. Acids, Acidulous and Ammoniacal Salts, Earthy and Metallic Salts, Chloride and Bichloride of Mercury.

Action. Uses. Antacid, Antilithic, Diuretic, Resolvent, Alterative.

Antidotes. Oil, Acids, Vinegar, Lemon-juice.

D. ♏x.—f℥j. gradually increased, with Infusion of Orange Peel, &c.

Potassii Iodidum, L. E. Potassæ Hydriodas, D.

Iodide of Potassium. *Ioduret of Potassium. Hydriodate of Potash.* *F.* Iodure de Potassium. *G.* Iod Kalium.

Iodide of Potassium (K I=166) was first discovered by Curtois in 1812. It exists in Sea as well as in some Mineral waters, in Sea-weeds and Sponges, and was first employed in medicine by Coindet.

Prop. It is a colourless salt, of an acrid saline taste; often opaque, but, when carefully prepared, transparent, and crystallized in cubes or in quadrangular prisms. The sides of the cubes are often regularly excavated, the angles remaining distinct. These contain no water of crystallization, but some is often lodged between the plates of the crystals: hence they decrepitate when heated. It fuses at a low red heat, and volatilizes unchanged. It is permanent in dry air; soluble in $\frac{2}{3}$ of its own weight of water. The following characters are given by the L. C., which places it now in the list of Materia Medica, giving no form of preparation. "Soluble in 6 or 8 parts of rectified spirit; very soluble in water. This aqueous solution either browns Turmeric very slightly, or does not affect it all. It does not alter the

colour of Litmus. Nitric Acid and Starch being added together, it becomes blue; but if Tartaric Acid and Starch are added, it is not coloured. (The object of this test will be presently shown.) What is precipitated from the same solution by Acetate of Lead is yellow, and is soluble in boiling water, but nothing precipitates on the addition of Lime-water or Chloride of Barium. Further, if that which is precipitated by Nitrate of Silver be digested in the stronger solution of Ammonia, and Nitric Acid then added to the filtered liquor, nothing is precipitated from it. From 100 grains dissolved in water, by the addition of Nitrate of Silver in solution, there are precipitated 141 grains of Iodide of Silver."

This last is a general test of purity. There are, then, five chief negative tests, denoting the absence of special impurities, to be presently considered. They are, Turmeric, Lime-water, Chloride Barium, the Tartaric Acid and Starch test; and the Silver and Ammonia test. It renders Iodine more soluble both in Water and in Alcohol. When dissolved, solution of Acetate of Lead produces a yellow precipitate (Iodide of Lead), and Protonitrate of Mercury, a greenish Iodide of Mercury; the Pernitrate, or Bichloride of Mercury, causes a greyish-red, which soon becomes brilliant red (Biniodide of Mercury), which is redissolved by an excess of either Iodide of Potassium or of Corrosive Sublimate.

There are two chief modes of preparing Iodide of Potassium. The first is generally adopted by manufacturers. Iodine is dissolved in a hot solution of Caustic Potash. The solution is evaporated to dryness, and the residue heated to redness with some charcoal. The salt is then dissolved out and crystallized. The exact proportions required are those of the equivalents, 126 of I. to 48 of pure Potash. 6 Eq. of each react mutually in this way. 5 of the Iodine combine with 5 of Potassium, setting free 5 of Oxygen. These 5 Eq. of Oxygen unite with the remaining Eq. of Iodine, forming Iodic Acid ($I\,O_5$), which combines with the other Eq. of Potash to make Iodate of Potash.

$$6\,I + 6\,K\,O = 5\,K\,I + K\,O,\,I\,O_5.$$

When heated to redness with charcoal, the 6 Eq. of Oxygen in the Iodate pass off as Carbonic Acid, making 1 more Eq. of K I. Any Iodate left forms an impurity.

The second process is that adopted in the P. L. of 1836, and in the present Pharm. of E. and D.

L. 1836. Mix *Iodine* ℥vj. with *water* Oiv., and add *Iron filings* ℥ij., stirring frequently with a spatula for half an hour. Apply a gentle heat, and when a greenish colour occurs, add *Carbonate of Potash* ℥iv. first dissolved in *water* Oij., and strain, wash the residue with two pints of boiling dist. water. Again strain. Let the mixed liquor be evaporated, so that crystals may form. Present E. and D. similar.

Iodide of Iron is first formed, the solution of which is greenish.

On the addition Carb. of Potash a decomposition takes place, the O of the Potash unites with the Iron, the Potassium set free forms with the Iodine an Iodide of Potassium, and the Oxide of Iron takes the C O_2, making Carbonate of Iron.

$$Fe\ I + K\ O,\ C\ O_2 = K\ I + Fe\ O,\ C\ O_2.$$

The K I is soluble, but the Carbonate of Iron is insoluble in water.

This mode is simpler in theory, but the other is somewhat easier of execution.

The chief adulterations and impurities are six. Water, free Potash, Carb. Potash, Sulphates, Iodate of Potash, Chlorides of Potassium and Sodium.

(1). *Water* may be present originally, or due to the deliquescence of the Salt. Iodide of Potassium should lose no weight when heated.

(2). Free Alkali may be present when it is prepared in the first way. It will then brown Turmeric paper, but may not precipitate Lime-water.

(3). *Carbonate of Potash* is a common impurity. The salt is then irregularly crystallized, very deliquescent, not entirely dissolved by Alcohol, in which Carb. Potash is insoluble. The solution also gives with Lime-water, and Sol. Chlor. Barium, a white Precip., soluble in Nitric Acid. It further destroys the colour of Tinct. Iodine.

(4). *Sulphates* (of Potash, Soda, or Lime), may be detected by the solution of Chlor. Barium, forming with it a white precipitate, insoluble in Nitric Acid.

(5). The presence of *Iodate of Potash* depends upon the employment of an insufficient heat in the first process, part of the Iodate remaining undecomposed. Now the addition of Chlorine-water to K I in solution sets free Iodine, which may be known by the blue colour with Starch. But if the salt be pure, and pure Sulphuric′, or even pure Nitric′, be added to it, Hydriodic Acid is disengaged, which does not affect Starch until some time has elapsed. Yet Sulphuric Acid generally, and Nitric Acid always, contain a minute quantity of Nitrous′ (N O_4), the action of which on the salt is similar to that of Chlorine. (*Vide Tests* for Iodine).

For this reason Tartaric Acid is employed, which is sure to set free Hydriodic′ only, and when added to pure K I and Starch causes no blue colour. But when any Iodate is present, this blue colour is produced, for this reason. Hydriodic and Iodic Acids are disengaged together. They immediately react on each other, producing free Iodine, and water from the H and O. Thus,

$$5\ H\ I + I\ O_5 = 6\ I + 5\ H\ O.$$

The test is very delicate, the blue colour being developed instantly when the Iodate is present.

(6). *Chlorides* (of Potassium or Sodium) are not uncommonly present. If 100 grains in solution give a precipitate with Nit. Silver, which when dry exceeds 141 gr., the presence of Chlorine may be suspected. The Chloride of Silver is soluble in Ammonia, the Iodide is not. So that if Chlorine be present, when this precip. is digested in liq. Amm. Fort., and Nitric′ sufficient to neutralize the Ammonia be added to the filtered solution, the Chloride Silver (having been dissolved out of the first precip.), will go down again. In the case of pure K I, there is no precipitate from the Ammoniacal liquor. (L.)

A similar test is given in the E. P.

Bromide of Potassium, and Xanthate of Potash, are more rarely present as impurities. (p).

Inc. Acids, Acidulous and Metallic Salts.

Action. Uses. Irritant, Stimulant of the Absorbents, Diuretic; in Venereal nodes and Rheumatism.

Antidotes. Evacuate the stomach; give Demulcents; obviate Inflammation, and allay Irritation.

D. gr. vj.—gr. x. ; ℈j. even ℈ij. have been given.

UNGUENTUM POTASSII IODIDI, L. D. Ointment of Iodide of Potassium.

Prep. L. Dissolve *Iodide of Potassium* ʒij. in boiling *Dist. Water* fʒij., and mix with *Lard* ℥ij. D. Same proportions.

This being a simple ointment, and devoid of colour, is preferable for some frictions, as it does not stain the skin. It may be employed stronger than in the above preparation.

UNGUENTUM IODINII COMPOSITUM, L. Unguentum Iodinei, E. Ointment of *Ioduretted* Iodide of Potassium. (*Vide* IODINE).

TINCTURA IODINII COMPOSITA, L. D. Compound Tincture of Iodine. Tincture of Ioduretted Iodide of Potassium. (*Vide* IODINE).

The presence of Iodide of Potassium increases the solubility of Iodine, and retains it in solution; so that it may be added to water without decomposition, or it may be given in Sherry wine. It is supposed to form with it a Biniodide ($K\,I_2$).

LIQUOR POTASSII IODIDI COMPOSITUS, L. D. Liquor Iodinei Compositus, E. Compound Solution of Iodide of Potassium. Solution of *Ioduretted* Iodide of Potassium.

Prep. L. Dissolve *Iodide of Potassium* gr. x., *Iodine* gr. v., in *Aq. dest.* Oj. D. The same.

E. Much stronger. *Iod. Pot.* ℥j. and *Iodine* ʒij. to *Water* f℥xvj. It contains sixty times as much Iod. Pot., and thirty times as much Iodine, as the L. and D. It is about the same strength as the compound tincture of the L. C.

The solution of the E. C. is a strong one, that of the L. and D. P. a

weak one; the doses must therefore be apportioned accordingly. It is of a reddish-brown colour, and may be given diluted with water.

D. f℥ij.—f℥iv. L.; of the E. preparation, ♏v. to ♏xv.

Emplastrum Potassii Iodidi, L. Plaster of Iodide of Potassium.

Prep. To prepared *Frankincense* ℥vj., melted with *Wax* ℨvj., add *Iodide Potassium* ℥j., first triturated with *Olive Oil* fℨij., and stir constantly until they cool.

This plaster is to be spread on linen, rather than on tanned leather.

Use. A good application to chronic glandular swellings, or scrofulous tumours.

Potassii Bromidum, (L. 1836).

Bromide of Potassium. *Hydrobromate of Potash.* *F.* Bromure de Potassium. *G.* Brom Kalium.

Bromide of Potassium (K Br=118), discovered by Balard in 1826; introduced into the L. P. of 1836, but omitted in 1851. The only officinal salt of Bromine.

Prop. It is white, without odour, of a sharp saline taste; crystallizes in transparent cubes, or four-sided flattish prisms, without any water of crystallization. Readily dissolves in Aq., less so in Alcohol. When heated, the crystals decrepitate, and may be fused without decomposition. Readily decomposed by Chlorine, which expels the Bromine; so also by the mineral acids, acidulous salts, and the metallic salts. This salt consists of 66·1 parts of Bromine with 33·9 of Potassium in 100 parts. (v. Tests for *Potassium* and *Bromine.*)

Prep. L. 1836. Add *Iron-filings* ℥j., and then *Bromine* f℥ij., to *Aq. dest.* Oj ß.; stir for half an hour. Apply a gentle heat till the colour becomes greenish (Bromide of Iron being formed). Then add *Carb. of Potash* ℥ij. and ℨj. dissolved in *Aq. dest.* Oj ß. Filter, wash what remains (Proto-Carbonate of Iron) in boiling *Aq. dest.* Oij. Filter again, mix the two liquors and evaporate to obtain crystals (Bromide of Potassium). In the first part of this process the Iron and Bromine, combining together, form a Bromide of Iron. On the addition of the Carb. Potash, the Oxygen of the Potash, combining with the Iron, forms the Protoxide of Iron, and this with the Carb' forms an insoluble Carb. Iron; the Bromine and Potassium, set free, combine and form the required Bromide of Potassium.

Tests. The crystals should be colourless, totally soluble in water, and not affect Litmus or Turmeric, as it is neither acid nor alkaline. Chlorine-water and Starch added together render it yellow (as characteristic of Bromine). Subjected to heat, they lose no weight (because no water is expelled). Chlor. Bar. throws down nothing from the solution, showing the absence of Sulphates. Gr. 10 of this salt are capable of acting upon gr. 14·28 of Nitr. Silver, and precipitating a yellowish Bromide Silver, which is dissolved by Ammonia, and but

very little by Nit′. If a larger quantity of Nitr. Silver is precipitated, a Chloride is present, probably that of Potassium.

Inc. Acids, Acidulous Salts, Metallic Salts.

Action. Uses. Stimulant, Alterative, Deobstruent.

D. gr. iij.—gr. x. three times a day.

Carbonate of Potash.

Subcarbonate of Potash. Salt of Tartar. Salt of Wormwood. Kali præparatum. F. Carbonate de Potasse. *G.* Kohlensaures Kali.

As this salt is obtained by the burning of vegetables, it must have been known at very early times. Dioscorides describes it by the name τεφρα κληματινης, or *cinis sarmentorum*, ashes of vine-twigs. ("cineris lixivium." Pliny, xxxviii. c. 51.) The Arabs are usually supposed to have been the first to make known this alkali (al-*kali*); but the Hindoos, in works from which the Arabs copied, made use of the ashes of plants. Potash is found in most of the alkaline-earthy minerals, as Mica, Felspar, Leucite, Nacrite. Carbonate of Potash has been found in a few mineral springs. It is probably found in the juices of some plants. But usually Potash is combined with other acids, then forming Acetates, Malates, Oxalates, Tartrates, &c.

By incineration, the vegetable acid is burnt, and at the same time acquiring more Oxygen and losing Hydrogen, becomes Carbonic′, which, combining with the Potash, forms a Carbonate of Potash. This, in its most impure state, is the Potash, or Rough Potash, of Commerce. To obtain this, land plants are burnt in countries where forests are most abundant, as N. America, Russia, Sweden, Poland. The wood is piled in heaps and burnt on the surface of the ground, in a place sheltered from the wind. "The ashes which are left consist of a soluble and insoluble portion. The *soluble* part is made up of the Carb. together with the Sulphate, Phosphate, and Silicate of Potash, and the Chlorides of Potassium and of Sodium; and the insoluble portion, of Carbonate and Subphosphate of Lime, Alumina, Silica, the Oxides of Iron and Manganese, and a little carbonaceous matter that has escaped incineration." (Wood and Bache.)

Potassæ Carbonas Impura, E. D. Impure Carbonate of Potash. *Potashes. Pearlashes.*

This is prepared on the large scale by subjecting to the action of flame crude or Black Potash, the *black salt* of American manufacturers. Instead of fusing it to make the *Potashes* of Commerce, the alkaline mass is transferred to a large oven-shaped or reverberatory furnace, where the flame is made to play over it; and being well stirred about, the black impurities (carbon) are burnt out, and the mass becomes a caustic salt of a white colour (W. and B.) with a tinge of blue, constituting the *Pearlash* of Commerce.

American Potash and American Pearlash, as ascertained by Vauquelin, contained in 1152 parts,

	(1)	(2)
Caustic Hydrate . . .	857	754
Sulph. Potash . . .	154	80
Chlor. Potassium . . .	20	4
Carbonic′ and Aq. . .	119	308
Insoluble matter . . .	2	6
	1152	1152

Russian Potash yields 772 parts of Caustic Hydrate; it used to be very impure, but is now more carefully prepared. For commercial purposes it is extremely necessary to have modes of ascertaining the quantity of alkali contained in any specimen of Commercial Potash. This is done by the process of Alkalimetry.

Uses. Chiefly pharmaceutical.

POTASSÆ CARBONAS, L. Potassæ Carbonas Purum, E. D.

Carbonate of Potash (K O, $CO_2 = 70$) is in white roundish grains; sometimes it may be crystallized from a strong solution, by slow cooling, in opaque rhombic octohedrons. The taste acrid, alkaline, and nauseous; odour none; so deliquescent as to form a liquid, which used to be called *Oleum Tartari per deliquium;* soluble in its own weight of water, insoluble in Alcohol; alkaline in its reaction on Turmeric and the infusion of Cabbage, &c. The common salt is a sesquihydrate, containing 2 Eq. of Pot. Carb. to 3 of water.

Prep. There are three ways in which this salt may be prepared, of a greater or less degree of purity. The L. P. of 1836 ordered it to be made by lixiviating and granulating crude Pearlashes, thereby getting rid only of the insoluble impurities. The E. P. orders Bicarb. Potash to be heated in a crucible to a red heat. 1 equiv. of Carb′ is driven off, and the product is very pure. The D. C. heat Bitartrate of Potash in an iron pot till vapours cease to be evolved. A product called *black flux* is obtained, consisting of Carb. Potash, Charcoal, and some Caustic Potash. This is lixiviated, and during filtration washed with a solution of Sesquicarb. Ammonia, to neutralize any free K O. The solution is evaporated, and again heated to low redness, to drive off Ammonia.

Tests. It loses no weight at a low red heat (E), but at a higher temperature 100 gr. lose 16 of water (L); from the solution supersaturated with pure Nitric′, neither Carb. Soda, nor Chlor. Barium throw anything down, and Nit. Silver but very little. "From 100 grains in solution 26·3 grs. of Carb′ are evolved on the addition of sulphuric acid." (L.) The E. P. rightly distinguishes between the purified (lixiviated) Pearlash and the *Pure* Carbonate. The latter should contain no sulphates or chlorides, and corresponds to the tests of the L. P. Silica may be detected by a cloudiness or fleecy precipitate forming on N′ or H Cl′, being added to neutralization; on then evaporating and igniting the residue, any Silica will be insoluble in water. The

C′ is readily recognized by effervescing with any of the acids, and by forming a milky solution with Lime-water. The Carbonate which is formed will effervesce and dissolve in Acetic acid. A white precipitate (Carbonate of Magnesia) is also formed when this salt is added to a solution of Sulphate of Magnesia; as this does not take place when Bicarbonate of Potash is added, this Sulphate is a useful test for distinguishing the one from the other. With Bichloride of Mercury a brick-red precipitate of Binoxide of Mercury is formed.

Inc. Acids and Acidulous Salts, Hydrochlorate and Acetate of Ammonia, Lime-water, Chloride of Calcium, Sulphate of Magnesia, Alum, and several other alkaline, earthy, and metallic salts.

Action. Uses. Corrosive, Antacid, and Poisonous like Liq. Potassæ. Diuretic, Resolvent, milder than Liquor Potassæ, Antilithic. Often employed for making effervescing Draughts. Carb. Potassæ gr. xx. = Cit′ or Tar′ gr. xviij. or f℥iv. of Lemon-juice.

D. gr. x.—ʒß.

Antidotes. Vinegar, Oil, Lemon-juice.

Liquor Potassæ Carbonatis, L. D. Solution of Carb. of Potash. *Aqua Kali. Oleum Tartari per deliquium. Liquor Potassæ Subcarbonatis.*

Prep. Dissolve *Carb. of Potash* ℥xx. in *Aq. dest.* Oj. Filter. D. Similar: but only half as strong. Sp. Gr. = 1·473, L.; 1·310, D.

D. ♏x.—f℥j.

Potassæ Bicarbonas, L. E. D.

Bicarbonate of Potash. *Potassæ Carbonas. Perfectly Saturated Carbonate of Potash. Aerated Kali. G.* Doppelt Kohlensaures Kali. *F.* Bicarbonate de Potasse.

This salt ($KO, 2CO_2 + Aq = 101$) was first prepared by Cartheuser in 1752, and examined by Bergmann, who devised various modes of preparing it. The older chemists obtained it by simply exposing Carbonate of Potash for some months to the air, or to an atmosphere charged with Carb′ until sufficient gas was absorbed. It may also be prepared as in the D. P. (L. 1836), by passing a stream of Carb′ gas through a solution of Carbonate of Potash to saturation.

Prop. Bicarbonate of Potash is a colourless and transparent crystalline salt; its crystal is a modification of a right oblique angled prism. Its taste is much milder than that of the Carbonate, and it has so little alkalinity as to colour Turmeric paper only slightly. It is soluble in about 4 parts of water at 60°, and in five sixths of hot water; boiling water speedily decomposes it from the expulsion of Carb′, and it becomes a Sesquicarbonate. It is insoluble in Alcohol. Exposed to a red heat it loses 1 equivalent of Carb′, likewise any

water which may be deposited within its crystals, and is converted into the Carbonate of Potash. Hence this method is adopted to procure the pure Carbonate. The Carb′ in this salt is readily detected by its abundant effervescence with acids, likewise by the insoluble precipitate formed by it in Lime or Baryta water. But a moderately diluted solution of Bicarbonate of Potash yields no precipitate with Sulphate of Magnesia or with Bichloride of Mercury; hence the former is often prescribed with it in effervescence. "The Bichloride of Mercury causes a slight white precipitate or opalescence with it." (*p.*) It is composed of per cent. K O 47·53+C′ 43·56+Aq. 8·91=100.

Prep. E. Mix *Carb′ of Ammonia* ℥iij ß. reduced to a fine powder, with *Carb. of Potash* ℥vj.; triturate them thoroughly together. Add gradually a very little water, till a smooth uniform pulp is formed. Dry this at a temperature not exceeding 140°, triturating occasionally. Continue the heat till a fine powder devoid of ammoniacal odour is obtained.

D. (L. P. 1836), obtains it by passing Carbonic′ (obtained by acting on marble with dilute H Cl) to saturation through a solution of the Carbonate. The solution is placed in a cool place that cryst. may form; these are then dried at a moderate heat, and kept in a well-stopped bottle.

In the D. process the Carb. Pot. takes an additional Eq. of Carb′, being converted into the Bicarbonate, but pressure is required for the proper absorption of the gas. In that of E. the Ammonia, and a small portion of the Carb′, are expelled by the heat; the remainder unites with the Carb. Potash to form the Bicarbonate.

Tests. The usual impurities in this salt being Carbonate or Sulphate of Potash and Chloride of Potassium, the P. tests are intended to detect them. L. E. Totally dissolved by water (unless impure); the solution slightly changes the colour of Turmeric, but highly if the Carbonate be present. Sulphate of Magnesia throws down nothing from this solution, unless it be heated. (A large portion of the Carbonate, Dr. C. says even 50 per cent., may be present, without Sulphate of Magnesia detecting it, when mixed with the Bicarbonate.) The E. P. states that a solution in 40 parts of water does not give a brick-red precipitate with solution of corrosive sublimate; (but it will do so "if the salt contains even so little as a hundreth part of Carbonate" (*c*), except when Chloride of Sodium is present.) After the addition of excess of Nitric′, Chloride of Barium or Nitrate of Baryta throws down nothing (unless Sulphates be present), and Nitrate of Silver very little if anything (if Chlorides be absent). By a red heat 100 parts lose 30·7 of Carb′ and of water. If the crystals be moist, the loss of water will be greater; and if Carb′ be deficient, the loss will be less.

Inc. Nearly the same as with Carbonate of Potash. Acids, acidulous salts, Acetate and Hydrochlorate of Ammonia, Lime-water, Chloride of Calcium, alkaline, earthy, and metallic salts.

Action. Uses. Antacid, antilithic, diuretic, resolvent, milder and less corrosive than the Carbonate.

D. ℈ß—ʒß or ʒj. For effervescing draughts, 20 grs. Bicarb. Potash = 15 grs. of Cryst. Cit′ or Tar′, or f ʒiijß of Lemon-juice.

AQUA POTASSÆ EFFERVESCENS, E. Effervescing solution of potash.

Prep. Dissolve *Bicarb. Potash* ℥j. in *Aq. dest.* Oj. Pass through the solution *Carb′* gas under pressure. This may be extemporaneously imitated by pouring a bottle of soda-water (*i. e. Carbonic acid* water) into a tumbler containing gr. xx. of Bicarb. of Potash.

This is a solution of Bicarb. Potash containing Carb′ gas in excess.

LEMON and KALI. A mixture of powdered *white sugar*, dried and powdered *citric acid*, and powdered *bicarbonate of potash*, employed for making extemporaneous effervescing draughts.

PULVERES EFFERVESCENTES E. D. The E. P. orders of *Tartaric acid* ℥j., *Bicarb. Potash* ℥j., and gr. 160. Reduce both to fine powder, and divide into 16 parts. Preserve the acid and alkaline powders in separate papers of different colours. D. Similar. The D. P. gives a similar form for *Pulveres Effervescentes Citrati*, containing Citric instead of Tartaric acid. Bicarb. Soda may be substituted for Bicarb. Pot. employing rather less.

POTASSII SULPHURETUM, L. E. Hepar Sulphuris, D.

Sulphuret of Potassium. *Hepar Sulphuris. Kali Sulphuratum.* *F.* Sulfure de Potasse. Sulfure de Potassium Sulfaté. *G.* Schwefel Kalium.

The Sulphuret of Potassium was formerly known by the name of *Liver of Sulphur.* The solubility of Sulphur in an alkaline solution was known to Geber; but Albertus Magnus taught the method of procuring Sulphuret of Potassium by fusion. (*p.*)

Prop. When carefully prepared, it forms a hard brittle solid, of a liver-brown colour; without smell when dry, but emitting a smell of Hydrosulphuric′ when moistened; taste acrid and nauseous; its solution in water is of an orange colour, with a strong odour. When exposed to the air, it becomes moist and greenish-coloured, and then white and without odour, from the action of Oxygen, by which ultimately a Sulphate of Potash is formed, while a portion of the Sulphur is deposited. It is readily decomposed by acids, as by H Cl′, as they evolve Hydrosulphuric acid, combine with the Potash, and precipitate the Sulphur; as also by most of the metallic salts, of which the metals are deposited in the form of Sulphurets. According to Berzelius, this compound consists of 3 Eq. of *Tersulphuret* of Potassium to one of *Sulphate* of Potash. $(3\,K\,S_3 + K\,O,\ S\,O_3)$. But Mr. Phillips assumes, from the researches of Fordos and Gelis, that it contains 2 Eq. of the *Pentasulphuret* with 1 of *Hyposulphite*, and some unaltered Carbonate. $(2\,K\,S_5 + K\,O,\ S_2\,O_2)$.

Prep. E. Rub together *Sulphur* ℥j., *Carb. Potash* ℥iv.; heat them in a covered crucible till they melt. D. Similar. The air is to be excluded during and after the process of solidification.

When Carb. Pot. is melted with excess of Sulphur, Carb′ is expelled. The Oxygen of ⅔rds of the Potash combines with 2 parts of Sulphur to form Hyposulphurous acid, which, uniting with the undecomposed Potash, forms 1 Eq. of Hyposulphite of Potash. Sulphuret of Potassium is at the same time formed by the union of the Potassium with a portion of the Sulphur, more or less of it remaining in excess.

$$3\,(KO, CO_2)+12\,S=KO, S_2O_2+2\,KS_5+3\,CO_2$$

An excess of Carb. Potash remains undecomposed. This preparation therefore, is a mixture of Pentasulphuret of Potassium with Hyposulphite of Potash, and some Carbonate.

Tests. Fresh broken, it exhibits a brownish-yellow colour. Dissolved in water, or in almost any acid, it exhales a smell of Hydrosulphuric acid. The aqueous solution is of a yellow colour. What is thrown down by Acetate of Lead is first red, but it afterwards becomes black. Dr. Pereira has ascertained that the alkaline monosulphurets give a black, and the polysulphurets a red precipitate with solutions of Lead. If the Sulphuret should have been long kept, and have become changed, these characteristics will not be seen.

Inc. Acids and metallic salts.

Action. Uses, Irritant, Stimulant, Diaphoretic. *Ext.* Detergent.

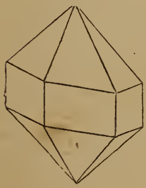
D. grs. iij.—x. or xv. with honey, or with soap made into pills, *Ext.* as an ointment with lard, or in a watery solution of soap, or in baths, 1 part to 1000 of water.

Potassæ Sulphas, L. E. D.

Sulphate of Potash. *Kali Vitriolatum. Sal Polychrestum. F.* Sulfate de Potasse. *G.* Schwefelsäures Kali.

Sulphate of Potash ($KO, SO_3=88$) is found near volcanoes, in a few minerals (Alum and Polyhalite), some mineral waters, in many plants, and in some animal secretions.

Fig. 10.



Prop. Sulphate of Potash is colourless and without odour, of a bitter saline taste; usually seen in small hard crystals formed of six-sided prisms terminated at both ends by six-sided pyramids; the prism is sometimes absent, or the angles are modified, or the crystal is double; the primary form is a right rhombic prism, or rhombic octohedron. The crystals are unalterable in the air, insoluble in Alcohol, but soluble in 16 parts of water at 60° F., and in 4 parts at 212°. They contain no water of crystallization, but a little mechanically lodged in the interstices; hence they decrepitate when heated, and melt at a red heat. If

heated with Charcoal, this Salt is converted into Sulphuret of Potassium.

Prep. E. Take of the *Salt remaining after the preparation of pure Nitric′* ℔ij. Dissolve in boiling *Aq.* C. ij.; add *White Marble* powdered q. s. till effervescence ceases. Filter and evaporate till a pellicle forms; set aside to crystallize; pour off the liquor, and dry the crystals.

D. Slaked Lime is substituted for Marble, and the Lime after neutralization precipitated by a solution of Carb. Potash. Lastly, the liquid is again acidified by Sulphuric′, and evaporated to form cryst.

The residual salt in the manufacture of Nitric′ is Sulphate of Potash with an excess of Sulph′. This excess the L. C. of 1836 directed to be driven off by heat; but the E. P. neutralizes it with Marble, and the D. P. with Lime, &c.

Tests. This salt is not liable to adulteration, but the L. P. gives as its characteristics, the sparing solubility in water and insolubility in Alcohol, and that Chloride of Platinum occasions in its solution a yellow precipitate (Chloride of Platinum and Potassium), and Chloride of Barium a white one (Sulphate of Baryta), insoluble in Nitric acid. No change ought to be produced in the colour of Litmus or of Turmeric paper; no precipitate with solution of Nitrate of Silver, nor any upon the addition of Ammonia or its Sesquicarbonate. 132 grs. of (dried) Sulphate Baryta may be formed from the precipitation of 100 grs. with Chlor. Barium. (L.)

Inc. Tartaric′, Chlorides of Barium and of Calcium, Acetate and Diacetate of Lead. Nitrate of Silver.

Action. Uses. Mild Cathartic and Deobstruent.

D. gr. x.—℥ß.

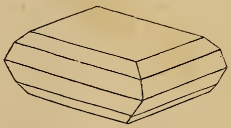
Pharm. Prep. Pulvis Ipecacuanhæ comp.

POTASSÆ BISULPHAS, E. D.

Bisulphate of Potash. *Potassæ Supersulphas. Sal enixum. F.* Bisulphate de Potasse. *G.* Doppelt Schwefelsaures Kali.

Bisulphate of Potash ($KO, 2SO_3 + 2HO = 146$) is obtained from the residual salt in the manufacture of Nitric′, and must have been long known; but the mode of preparing it was shown by Link towards the end of the last century.

Fig. 11.



Prop. It is colourless and without odour, but has a very acid bitter taste. It crystallizes in small flat prisms belonging to the right rhombic system, when there is an excess of Sulphuric acid. It is very soluble in water, but insoluble in Alcohol; unalterable in dry air; moderately heated, the crystals melt into an oily-looking fluid; at a red heat lose their water of crystallization and one proportion of acid, and become simple Sulphate

of Potash. The solution reddens vegetable blues, and "a solution in eight waters effervesces briskly with alkaline Carbonates." E.

Prep. E. Dissolve of the *Salt remaining after the distillation of pure Nitric'* ℔ij. in boiling *Aq.* Ovj. Add *Sul'* f℥vij. and f℥j., concentrate the solution, cool, and crystallize. The E. C. directs an excess of Sul' to prevent the deposition of Sulphate and Sesquisulphate of Potash, in consequence of the water uniting with a portion of the Sulphuric Acid (*p.*) The D. C. prepares it by saturating 1 part Sulph', diluted with 6 parts of water, with Carb. Potash obtained from Pearlash q. s.; then adding as much acid as was used in the first instance, and evaporating so that the solution may crystallize on cooling.

Tests. The Sulph' and Potash may be detected by their respective tests, and this salt may be distinguished from the Sulphate of Potash by the above acid characters.

Inc. Alkalis, Earths, and their Carbs.; many Metals, and Oxides.

Action. Uses. Purgative. Effervescing Purgative with an equal weight of cryst. Carbonate of Soda.

D. ℈j.—ʒij. diluted with water, &c.

PULVIS SALINUS COMPOSITUS, E. Compound Saline Powder.

Prep. Take *Sulphate Potash* ℥iij., *Sulph. Magnesia* and pure *Muriate of Soda* āā ℥iv. Dry the salts separately with a gentle heat; pulverise and triturate them well together. Preserve the compound in well-stopped vessels.

Action. Uses. This is an useful combination of several salts, in which some degree of stimulant is combined with the cathartic properties. It may be beneficially taken in costive habits.

D. ʒij.—ʒiij. dissolved in water.

POTASSÆ SULPHAS CUM SULPHURE, E. *Sal Polychrestum Glaseri. Glaser's Sal Polychrest.*

Prep. Mix *Nitrate Potash* and *Sulphur* equal parts; throw the mixture in small portions into a red-hot crucible; when the deflagration is over, and the salt cools, reduce it to powder, and preserve it in well-stopped bottles.

Here the Sulphur burns with its characteristic blue flame, taking Oxygen from the Nitric acid of the Nitrate, and a Sulphate of Potash is formed, mixed wlth some Sulphite, it is supposed. This is undetermined (Christison). This salt is much more soluble than Sulphate of Potash, crystallizes in rhombic prisms, "has a sulphureous odour, as well as its solution, but Sulphuretted Hydrogen is not disengaged on the addition of a strong acid."

Action. Uses. This salt acts as a mild purgative, and may be given with an equal weight or more of Bitartrate of Potash. It was formerly much used in Dyspepsia and chronic cutaneous diseases. Dr. Duncan says that in use it agrees with the Sulphureous waters.

D. ʒß.—ʒj.

Potassæ Nitras, L. E. D.

Nitrate of Potash. Nitre. *Nitrum. Sal Petræ. Saltpetre. F.* Nitrate de Potasse. Nitre. *G.* Salpeter. Salpetersaures Kali.

Nitrate of Potash ($K\ O, N\ O_5 = 102$), Nitre, or Saltpetre, being a production of nature, must have been early known, especially as both the Indians and Chinese have long been acquainted with the making of fireworks, and the former have an early process for making Nitric′, in which they have been followed by Geber and other Arabian authors. The names *neter* in the Old Testament, and *nitrum* in ancient authors, were applied to Carbonate of Soda, but they were also used in a generic sense, signifying several substances.

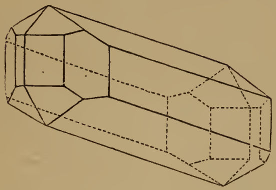
Nitre is found effloresced on the soil in many parts of India, where there is no animal matter, and being washed out, a fresh crop is formed after a few years. The soil is sandy, with mica interspersed, which will continue to yield a supply of Potash, while the Nitric′ must be furnished by the combination of the Oxygen of the atmosphere with its Nitrogen, or, as suggested by Liebig, by the oxidation of the Ammonia which he has proved is always present in the atmosphere. Mr. Stevenson (Prinsep's Journ. ii. p. 23) has detailed the process, and shown that the saline earth contains of salts soluble in water, Sulphate of Soda, Muriate of Soda, Nitrates of Lime and of Potash. The Nitrate of Lime is easily converted into that of Potash by lixiviating the saline soil over a filter of wood-ashes, which contains Carbonate of Potash (the C′ combines with the Lime, and the N′ with the Potash), a Carbonate of Lime is precipitated, and the Nitrate Potash in solution is evaporated and put aside to crystallize. The salt obtained contains from 45 to 70 per cent. of pure Nitrate of Potash. It is redissolved and crystallized, but still contains impurities, which are termed so much per cent. of *refraction.* The ordinary kinds are called *rough* or *crude* Saltpetre, and the purer *East India refined.*

In Europe Nitre is prepared artificially in Nitre-beds or Nitre-walls, and in ditches covered by sheds, where urine is added to different mixtures of earth with refuse vegetables, various animal substances, and calcareous matter, &c. The whole is exposed to the action of the air. The Nitrogen of the decomposing organic matter, becoming oxidized, and combining with the bases, forms Nitrates, and the foregoing processes being adopted, similar results are obtained.

Prop. Nitrate of Potash in its purified state is colourless and semi-transparent, without odour, of a sharp and cooling, disagreeable, saline taste; crystallized usually in long, striated, six-sided prisms, terminated at each extremity with dihedral summits, or in two or six converging planes, sometimes in a dodecahedron formed of two six-sided pyramids joined base to base. The crystals are anhydrous and

unalterable in the air. Sp. Gr. 1·92. Soluble in 4 parts of water at 60°, producing cold, and in an equal weight of boiling water. Insoluble in Alcohol, and sparingly so in dilute Alcohol. Heated to about 660°, it melts into a transparent fluid; on cooling, it forms a white semi-transparent mass, which used to be called *Sal Prunellæ* when run into small balls. By a high degree of heat, Nitre is decomposed, Oxygen gas being first given off, and afterwards mixed with Nitrogen, while Hyponitrite of Potash is left behind. Water is apt to be lodged between the plates of the crystals, particularly when these are large; hence in gunpowder manufactories, small crystals, if equally pure, are preferred. With inflammable substances the decomposition of Nitre, when heated, is rapid, light and heat being disengaged, constituting what is called the deflagration of Nitre. This takes place also with some of the compound acids, into which Carbon enters as a constituent.

Fig. 12.



Prep. Nitre being required of the best quality for the manufacture of gunpowder, that of commerce is usually sufficiently pure for medical purposes. But it sometimes requires purification to the extent of a single solution, and re-crystallization, as in the D. formula.

POTASSÆ NITRAS PURUM, D.

Prep. Dissolve *Commercial Nitre* ℔ iv. in Oij. of *boiling Dist. Water.* Let the solution cool, and stir it that the salt may form in minute crystals. These, when drained, are washed in a percolator with Oiij. of *cold Dist Water,* or until the liquid which trickles through ceases to precipitate Nit. Silver. Dry the salt in an oven.

Tests. The presence of Nitric′ and of Potash may be detected by their respective tests. Nitre should be entirely soluble in distilled water. The solution should not be affected by Chloride of Barium (no Sulphates), or by Nitrate of Silver (no Chlorides). Calcareous salts, which occur only in rough Nitre, may be detected by the Oxalate of Ammonia throwing down a white precipitate of Oxalate of Lime. Sulphate of Potash is now seldom found in the best Nitre, and only a small proportion of Chloride of Potassium or of Sodium.

Inc. Sulph′, Alum, the Alkaline and Metallic Sulphates.

Action. Uses. Refrigerant, Diuretic. In large doses an irritant poison. Used also in Scurvy. *Ext.* Refrigerant and Detergent.

D. gr. v.—gr. xv. with Sugar, or in water, or in mucilaginous drinks.

Antidotes. Remove poison from Stomach, allay irritation, and subdue inflammation.

Off. Prep. Ung. Sulphuris comp. L.

Potassæ Chloras, L. D.

Chlorate of Potash. *Oxymuriate* or *Hyperoxymuriate of Potash.* *F.* Chlorate de Potasse. *Muriate Oxygéné* and *Hyperoxygéné de Potasse.* *G.* Chlorsaures Natron.

Chlorate of Potash ($KO, ClO_5 = 124$), though previously made, was first clearly distinguished from other salts by Berthollet. It is now largely manufactured for the preparation of detonating compounds and lucifer matches.

Prop. Chlorate of Potash is colourless, in small brilliant scales or quadrangular crystals, glittering and pearly in lustre, not unlike those of Boracic′. Taste cool, penetrating, and austere, something resembling that of Nitre. Like it, the crystals are anhydrous and unalterable in the air. Sp. Gr. 1·98. Soluble in about 30 parts of water at 32° F., in 18 parts at 60°, and at 212° F. in less than 2 parts of water; little soluble in Alcohol. The crystals crackle and become luminous in the dark when rubbed briskly. Heated, they lose about 2 per cent. of water mechanically lodged, melt at a dull red heat, and give out nearly 40 per cent. of Oxygen gas, the Acid and Alkali both being decomposed, and only Chloride of Potassium left. It deflagrates when thrown on live coal, in the same way as Nitre; but detonates violently when rubbed with combustible bodies, as Sulphur, Charcoal, Phosphorus, &c.

Prep. Chlorate of Potash is prepared by passing, to saturation, a current of *Chlorine* through a solution of 15 parts of *Carbonate of Potash* in 38 of cold *water.* The solution is then exposed to the air for a few days, agitating occasionally to allow of the escape of any free Chlorine. Scales and crystals of Chlorate of Potash are deposited. If these are separated, more may be obtained by evaporating the mother liquor. All may be purified, if washed with cold, dissolved in twice their weight of hot water, and re-crystallized.

Here effervescence ensues, chiefly from the escape of Carb′ gas. The Potash becomes decomposed, its Oxygen combining with the Chlorine to form Chloric acid. This unites with some of the remaining Potash, and a Chlorate of Potash is formed: 5 equivalents of Potash are decomposed to yield the 5 Eqs. of Oxygen required to form Chloric′, which combines with 1 Eq. of undecomposed Potash. The Potassium set free, combines with Chlorine to form Chloride of Potassium; and thus when Chlorate of Potash is deposited in crystals, Chloride of Potassium remains in solution with Hypochlorite of Potash, a little free Hypochlorous acid, and some Chlorate of Potash.

A better mode of preparation has been proposed by Mr. Crace-Calvert. Chlorine gas (from HCl and Binox. Manganese) is passed through a mixture of Lime, Potash, and water. The proportions are those of 6 Eq. of Cl, 5 of Lime, and 1 of Potash. 5 Cl combine with 5 of Calcium, forming 5 Ca Cl, and setting free 5 O. This Oxygen unites with the remaining Eq. of Cl, making Chloric

($Cl\,O_5$), which unites with the Eq. of Potash. Thus there is no loss. The solution is evaporated and the Chlorate crystallized.

Tests. Entirely soluble. Chloride of Potassium is the most probable impurity. This is readily detected by Nitrate of Silver, which will give a white precipitate (Chloride of Silver) if any be present; otherwise the solution will be unaffected, as stated in the L. P. 100 gr. at a red heat give out nearly 39 grains of Oxygen gas.

Action. Uses. Refrigerant, Diuretic, Supplier of Oxygen, Useful in Saline treatment.

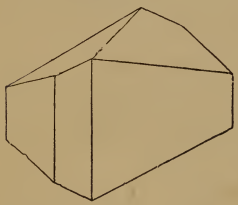
D. gr. x.—gr. xv.

Potassæ Tartras, L. E. D.

Tartrate of Potash. (Bibasic). *Tartrite of Potash. Kali Tartarizatam Tartarum solubile. F.* Tartrate de Potasse. *G.* Einfach Weinsaures Kali.

Tartrate of Potash ($2\,K\,O, \overline{T}$, or $2\,K\,O,\ C_8\ H_4\ O_{10} = 228$) has not been found in nature, but has been known to chemists since the time of Lemery in the seventeenth century.

Fig. 14.



Assuming the above formula of Tartaric′, which is generally adopted by chemists, the acid must be considered as *Bibasic*, and this as a *Neutral* or *Bibasic Salt*. (Mr. Phillips halves the Eq. of the acid, regarding it as Monobasic.)

Prop. This salt is colourless, and without odour, but of a bitterish saline taste. It is usually sold in the form of a small granular powder; the evaporation during its manufacture having been carried nearly to dryness with frequent stirring. But it can be crystallized in regular four or six-sided prisms with dihedral summits, the primary form being a right rhomboidal prism. The large cryst. contain 4 Eq. of $H\,O$. (Thomson.) Sp. Gr. 1·55. Deliquescent in the air, soluble in its own weight of water, and in about 240 parts of boiling Alcohol. Heated, it swells up, chars, and is converted into Carb. Potash. Its solution is readily decomposed by Sul′, or any other strong acid, as well as by several acidulous salts; crystals of the Bitart. being deposited. As in the case of the Bitart., soluble Barytic and Lime Salts, Lime-water, and Chlor. Calcium, Nitr. Silver, and the Acetates of Lead cause white precipitates of Tartrates, which are soluble in N′.

Prep. E. Dissolve *Carb. Pot.* ℥xvj. or q. s. in *boiling Aq.* Ovj., add *Bitartrate of Potash* powdered ℔iij. till neutralized. Boil, filter, and boil, till a pellicle floats. Set aside to cool and crystallize. The remaining liquor will yield more crystals by further concentration and cooling. D. Similar.

Effervescence is caused by the escape of $C\,O_2$. The Eq. of Potash unites with an Eq. of the Monobasic Supertartrate to form one of the Bibasic Neutral Salt.

$$K\,O,\,T + K\,O = 2\,K\,O,\,T.$$

This salt is also formed in making Tartaric′ (q. v.), and may be obtained by evaporation.

Tests. If pure, this Salt is of easy solubility, neutral to Litmus and to Turmeric paper. Most acids, even the Citric, cause a deposit of crystals of the Bitartrate, by combining with half of the Potash. The precipitate occasioned by Chlor. Barium or Acet. Lead is soluble in diluted Nitric′. L. 44 grs. in solution are not entirely precipitated by 55 grs. Nitr. Lead. E. P. Showing that there are no Sulphates, and that only the due proportion of Tartaric′ is present.

Inc. Acids (even Citric′). Acidulous Salts. Soluble Salts of Lime, and of Baryta. Acetate of Lead. Nitrate of Silver.

Action. Uses. Cathartic.

D. ʒij.—℥j.

Citrate of Potash is not officinal, but it is frequently taken when effervescing draughts are prepared with either the Carbonate or Bicarbonate of Potash and Citric Acid or Lemon-juice. Tartate of Potash will be produced when Tartaric′ is employed.

Potassæ Bitartras, L. E. D.

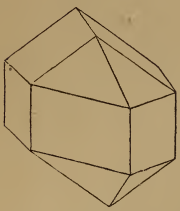
Supertartrate of Potash. (Acid or Monobasic.) *Bitartrate of Potash. Cream of Tartar. Argol. F.* Tartrate acide de Potasse. *G.* Doppelt Weinsaures Kali.

Bitartrate of Potash ($K\,O,\,\bar{T},\,H\,O = 189$) is well known by the name of Tartar, and must have been known ever since wine has been made from the grape, in the juice of which it exists. During the fermentation of wine, Sugar disappears and Alcohol is formed, and the salt not being soluble in this, is deposited on the bottom and sides of casks, as a crystalline crust, which, according to the colour of the wine, forms either *red* or *white Tartar* or *Argol.* This was known to the ancients, and is the Fæx Vini of Diosc. v. c. 13. (Hindoo Med. p. 97.) Its nature was determined by Scheele in 1769. It is largely purified both at Montpelier and at Venice. It is an acid or supersalt, containing only 1 Eq. of K O to 1 of the acid, whereas 2 are required for the neutralization of the latter. (Mr. Phillips considers it strictly a Bitartrate. 2 Eq. of his Tartaric′ correspond to 1 Eq. of other chemists.)

Prop. The Bitartrate of Potash of commerce is in white crystalline crusts, formed of clusters of small crystals aggregated together, which are hard and gritty under the teeth, dissolve but slowly in the mouth, and have an acid and rather pleasant taste. The crystals are semi-transparent irregular six-sided right rhombic prisms, or tri-

angular prisms with dihedral summits. Sp. Gr. 1·95. Unaltered in the air, insoluble in Alcohol, soluble in 60 parts of water at 60°, and 18 parts at 212°. The solution is acid, reddens Litmus, effervesces with alkaline Carbonates, is liable to become mouldy and decomposed. This is from the growth of the filaments of an algaceous plant, the *Sirocrocis Tartarica*, which also forms in other solutions containing Tartaric acid. The application of heat causes the crystals first to swell up, lose 1 Eq. of water, and then to become decomposed; gases are evolved, and a mass composed of Carbonate of Potash and of Charcoal is left, which is called *black flux*. If Tartar is deflagrated with its weight of Nitre, *white flux*, or Carbonate of Potash, is left. It is not easily decomposed by acids; its acid, *v.* Tar′, will decompose the neutral Potash Salts; Cream of Tartar being produced. Solutions of Baryta and Lime, and of Acetate of Lead, form insoluble white Tartrates of the respective substances. With salifiable bases forming soluble Tartrates, it gives rise to double salts, several of which are officinal, as Potassio-tartrate of Soda, Potassio-tartrate of Antimony, *v.* Soda, Iron, Antimony. Bor′ and Borax much increase the solubility of Cream of Tartar, forming Boro-tartrate of Potash, or *Soluble Cream of Tartar.* To form this salt Liebig directs 47½ parts of the Bitart. to be treated with 15½ parts of crystallized Bor′ until the whole be dissolved, and the solution then evaporated to dryness.

Fig. 13.



Imp. Bitartrate of Potash contains from 2 to 6, sometimes as much as 14 per cent. of Tartrate of Lime; occasionally powdered white Quartz, or Sand. It ought to be "entirely soluble in 40 parts of boiling water; 40 grs. in solution are neutralized with 30 grs. of cryst. Carb. Soda; and when then precipitated by 70 grs. of Nitr. Lead, the liquid remains precipitable by more of the test." E. P. Alum or Bisulph. Potash in powder, may be detected by Chlor. Barium.

Inc. Strong Acids, Alkaline Carbonates, Salts of Lime and Lead.

Action. Uses. Refrigerant, Diuretic, Laxative.

D. ʒß.—ʒij. as a diuretic. ʒiv.—ʒvj. as a laxative.

Pharm. Prep. Pulv. Jalapæ Comp. Pulv. Scammonii Comp.

Potassæ Acetas, L. E. D.

Acetate of Potash. *Kali Acetatum. Sal Diureticus. Terra foliata Tartari. Digestive Salt of Sylvius.* F. Acetate de Potasse. *G.* Essigsaures Kali.

Acetate of Potash ($KO, \bar{A}$, or, $KO, C_4 H_3 O_3 = 99$) was known to Raymond Lully in the thirteenth century, and probably earlier.

It is found in the sap of many plants, as in some of those which by incineration yield Carb. Potash.

Prop. It is colourless, and with little odour, but has a sharp saline taste. It is usually seen as a shining foliated mass, made up of small pellucid scales, but by slow evaporation it may be made to crystallize in thin compressed laminæ, or in needles. It is so deliquescent as soon to become converted into an oily-looking liquid when exposed to the air. It is soluble in its weight of water; also in Alcohol. Subjected to heat, it fuses, and then becomes decomposed. Hydrogen and Carb′ escape. Carb. Potash, as in the case of the Tartrates, remains a residue. Acetate of Potash is decomposed by Sul′ and other strong acids, giving off an odour of Acetic Acid; and also by several Salts. Comp. per cent., Pot. 48·5 + Ac. 51·5 = 100.

Prep. E. Take *Carb. Pot.* (dry) ℥vij. or q. s. and add it gradually to Pyroligneous′ Oiſs. till saturation takes place. Evaporate in a vapour-bath till it forms a concrete mass when cold. Let it cool and crystallize in a solid cake. Keep it in well-closed vessels.

D. Similar: the *Acetic Acid of Commerce* being substituted for the Pyroligneous′ of the E. P., than which it is somewhat stronger.

The Acetic′ unites with the Potash, expelling the Carb′ Gas.

When distilled Vinegar is used, the solution always becomes brown. It is best to use pure Acetic′ diluted. To prevent an excess of Potash from browning the product, some excess of acid should be employed. This Salt may also be obtained by double decomposition between Acetate of Lead and Sulphate of Potash; but it then sometimes contains Lead.

Tests. Sulphuric Acid disengages Acetic vapours; a red heat converts it into Carb. Potash. Entirely soluble in water and Alcohol: should not affect either Litmus or Turmeric, though it is apt to have an alkaline reaction. Its solution is not affected by Chlor. Barium or Nitr. Silver (showing absence of Sulphates and of Chlorides). But if the solution be strong, a precipitate may be formed by the Silver test. This, however, is soluble in water or in Nit′. If metals are present, as Lead, Hydrosul′ will give a blackish precipitate. Copper is further precipitated brown by Ferrocy. Potassium.

Inc. Acids. Sulphates of Soda and Magnesia, and several earthy and metallic Salts.

Action. Uses. Diuretic; in large doses acts as a purgative. If continued, will render the urine alkaline as Carb. Potash does, for, like other salts of the Alkalis with vegetable acids, it is apt to be converted into a Bicarbonate while in the system. (Wöhler.)

D. ℈ſs.—ʒj. as a diuretic. ʒj.—ʒiij. as a cathartic.

Potassii Ferrocyanidum. (*vide* Compounds of Iron.)

Potassæ Bichromas, D. Bichromate of Potash ($KO, 2\,CrO_3 =$ 152). It is rarely used as a medicine, though chemically interesting. It is employed by the D. C. in the preparation of Valerianate of Soda.

Sodium.

Natrium. *F.* Sodium. *G.* Natrium.

Sodium or *Natrium* (Na=24) is the metallic base of Soda, discovered by Sir H. Davy in 1807. It is of the consistence of wax, malleable, and spreads into thin leaves. Sp. Gr. 0·972. Opaque, but with a brilliant silvery lustre; floats on water, producing a hissing effervescence, in consequence of the escape of Hydrogen, while the Oxygen of the water combining with the Sodium forms a Protoxide, or Soda, which remains in solution. Sodium fuses at 190°, and volatilizes at a white heat. It conducts both Heat and Electricity. It exists in Sea-water and Rock Salt, but in combination with Chlorine. As it oxidizes in the air, it must be preserved under Naphtha.

Soda. Protoxide of Sodium.

Mineral or Fossil Alkali. *F.* Soude. *G.* Natron. *Natron* or *Nitron* of the Ancients (but these names apply rather to the Carbonates, q. v.).

Soda (Na O=32) is obtained by adding Caustic Lime to a solution of Carbonate of Soda; a precipitate takes place of Carbonate of Lime. The Soda being left in solution, may, by evaporation, be obtained as Hydrate of Soda (Na O, H O=41). Soda is found to be a constituent of several minerals, as Sodalite, &c., and is very abundant in combination with different Acids. It has been obtained in four-sided crystals, acuminated by four planes, of a greyish-white colour; acrid and caustic, soluble in both water and Alcohol; melting at a red heat, and efflorescing in the open air. Its properties are very similar to those of Potash. The affinity of Soda for water in the air is less; it first becomes moist, absorbs Carbonic′, and effloresces. Glass and Soaps made with Soda are harder than those made with Potash. The Salts differ in their forms from those of Potash; less Soda will saturate a given quantity of acid; and Soda Salts are for the most part more soluble than the corresponding ones of Potash. They do not yield crystals of Alum, when added to a solution of Sulphate of Alumina; nor an insoluble Bitartrate, on addition of Tartaric′; and Chloride of Platinum throws down no precipitate. They may be distinguished from the Alkaline Earths by no precipitate taking place on addition of Carbonate of Potash or of Soda; while the alkaline Ferrocyanides and Hydrosulphurets, which distinguish Metallic Salts, cause no precipitates in solutions of salts of Soda.

Tests. The only positive tests are, that Soda and its Salts give a rich yellow tinge to the flame of Alcohol, and, when in solution, are precipitated by a solution of Antimoniate of Potash.

Action. Uses. Similar to those of Potash.

LIQUOR SODÆ, L. Liquor Sodæ Causticæ, D. Solution of Soda.

Prep. L. Take of crystallized *Carb. Soda* ℥xxxi., *Lime,* ℥ix., and boiling *Dist. Water* Cj. Prepare as Liq. Potassæ. D. Similar. Sp. Gr. L. 1·061, in 100 gr. are contained 4 of Soda. D. 1·056.

Tests. In most characters this solution resembles Liq. Potassæ. It differs from that in giving a precip. with Antimoniate of Potash, and none with Tartaric Acid, Fluosilicic Acid, or Bichloride of Platinum. Its chemical and therapeutical applications are similar to those of Potash, than which it is a weaker base, and a less active remedy.

Uses. Chiefly Pharmaceutical. The L. P. employs it in the preparation of Oxysulphuret of Antimony, the D. P. to make Valerianate of Soda.

SODÆ CARBONAS.

Carbonate of Soda. *Sodæ Subcarbonas. Aerated Mineral Alkali. Fossil Alkali.* (One of the kinds of *Nitrum* of the Ancients.)

Carbonate of Soda is the *neter* of the Hebrews. It was known to the early Hindoos, and is by them called *Sajji noon* (i. e. *Sajji* or Soda Salt); it is the *Sagimen vitri* of Geber. The Natron lakes of Egypt were known to the ancients, and it was early employed in glass-making, &c.

SODÆ CARBONAS IMPURA. Impure Carbonate of Soda, or Barilla. *F.* Soudes de Commerce. Soudes brutes. *G.* Kohlensaures Natron.

The substance known by the name of Soda is a Carbonate of Soda, but mixed with various impurities, according to the source whence it has been obtained; that is, either from the Natron lakes, from the burning of maritime plants or sea-weeds, or from the decomposition of other Salts of Soda. It is used in Pharmacy for the purpose of obtaining from it pure Carbonate of Soda.

BARILLA is the Ash obtained by burning plants, on the shores of the Mediterranean, of the Red Sea, and Indian Ocean. These plants belong mostly to the natural family of Chenopodeæ, q. v.; and chiefly to the genera Salsola, Salicornia, Suaeda, and Chenopodium. The quantity of Carbonate of Soda in the ash varies from 25 to 40 per cent., and is produced by the combustion of various Salts of the Vegetable Acids. The Soda is no doubt obtained from the soil, for Du Hamel planted Soda-plants inland, and they yielded only Potash. Infusion of a Salsola in cold water afforded by evaporation two Salts, Carbonate of Soda and Chloride of Sodium. *Murr. Chem.* ii. p. 612. A portion of the Chloride is no doubt converted into the Carbonate during the incineration.

Kelp used to be prepared on the coasts of Scotland and its islands, also on those of Ireland and Wales, and on that of Normandy in France, by burning a great variety of Algæ or Sea-weeds. The ashes when cold form *Kelp*, which is in hard cellular masses, of a bluish grey colour, and of a disagreeable alkaline taste, containing from 3 to 8·5 per cent. of Carbonate of Soda, and other salts, as in the case of Barilla, but also some Potash and Iodine (v. p. 45).

Carbonate of Soda is, however, now obtained very cheaply from Chloride of Sodium or Sea-salt. This is first converted into Sulphate of Soda by the action of Sul′, then mixed with pounded small Coal and Chalk, and heated in a reverberatory furnace and stirred. The Carbonaceous matter abstracts Oxygen both from the Sul′ and the Soda; Sulphuret of Sodium is formed, and decomposed by the Lime; Carbonate of Soda, insoluble Oxi-Sulphuret of Calcium, Caustic Soda, and Carbonaceous matter, being the result. The insoluble parts are separated by lixiviation, and the Sulphur subsequently burnt away; during which the Soda is completely Carbonated. The mass now contains about 50 per cent. of Soda. Being lixiviated and evaporated, the Carbonate is obtained in large crystals. As Barilla is not sufficiently pure for medicinal purposes, lixiviation, evaporation, and crystallization, are required, to bring it up to the purity required by the Colleges.

Sodæ Carbonas, L. E. D. Carbonate of Soda. *Natron præparatum.*

Fig. 15.

Carbonate of Soda ($NaO, CO_2 + 10\,Aq. = 144$), prepared as above, is in large and clear colourless crystals, without odour, but having a disagreeable sub-alkaline taste, and an alkaline reaction on Turmeric. The crystals are oblique rhombic prisms, or rhomboidal octohedrons, entire or broken. In the air they effloresce, but, when exposed to heat, melt in their water of crystallization; as this is dissipated, the Salt becomes a white, porous, anhydrous mass, known as Dried Carbonate of Soda. Water at 60° dissolves half, and at 212° its own weight of this salt, but it is insoluble in Alcohol. It has the characteristics of a Carbonate with Acids and Earths, and is distinguished from the Bicarbonate by giving a brick-red precipitate with Bichloride of Mercury, and a white one (Carbonate of Magnesia) with Sulphate of Magnesia. It is used for the purpose of converting Oils and Fats into Soap. Composed per cent. of Na O 22·2, C′ 15·3, Aq. 62·5=100.

Tests. Carbonate of Soda prepared frem the Sulphate is usually very pure, but the Salt is apt to contain some Sulphate of Soda, and also the Chlorides of Sodium and of Potassium. The following characteristics of purity are presented by the L. C. "It is colourless,

translucent, efflorescent in the air, soluble in water. This solution changes the colour of turmeric to brown. When supersaturated with H Cl′, Chlor. Barium throws down from it no precipitate—(absence of Sulphates). 100 grains of the Carbonate lose 62·5 of Water at a red heat, and the same quantity gives off 15·28 gr. of Carbonic′ on the addition of dil. $S O_3$."

"A solution of 21 grains in Aq. dest. f℥j. precipitated by 19 grains of Nitrate of Baryta, remains precipitable by more of the test; and the precipitate (Carbonate of Baryta) is entirely soluble in Nitric Acid." E. P. This will leave 0·75 per cent. of the salt still in solution, if it be of due purity; so that after filtration Nitrate of Baryta will again cause a precipitate. (*c.*)

Inc. Acids, Acidulous Salts, Lime-water, Hydrochlorate of Ammonia, Earthy and Metallic Salts.

Action. Uses. Antacid; in large doses, irritant poison. Diuretic, Antilithic.

D. gr. x.—ʒß or ʒj. For effervescing draughts, gr. xx.=gr. x. of Cit′ or Tar′, and fʒij.ß of Lemon juice; used also for Seidlitz Powders.

Antidotes. Fixed Oil, Vinegar, Lemon-juice, Cream of Tartar.

LIQUOR SODÆ CARBONATIS. D.

Prep. Dissolve cryst. *Carb. Soda* q. s. or ℥iß. in *Aq. dest.* Oj. so that the liquid shall have a Sp. Gr.=1·026.

D. fʒj.—ʒij.

SODÆ CARBONAS EXSICCATA, L. E. D.

Dried Carbonate of Soda ($Na\,O, C\,O_2=54$) is the result of the expulsion of the whole of the water of the crystallized Salt, so that 54 grains of the Anhydrous Salt are equal to 144 grs. of the Crystallized Salt. Composed of Na O, 59·3+C′ 40·7=100. It requires to be heated to redness, that it may be of uniform strength.

Prep. L. Apply heat to *Carb. Soda* ℔j. until the crystals crumble down; then burn to redness; lastly, rub to powder. E. D. Similar.

D. gr. v. to gr. xx. in powder or in pills.

SODÆ SESQUICARBONAS.

Sesqui-Carbonate of Soda. Natron. *F. Natron.* *G.* Anderthalb Kohlensaures Natron.

A Sesquicarbonate of Soda ($2\,Na\,O, 3\,C\,O_2, 4\,H\,O=166$) exists in nature; for the Trona found near Tripoli in Africa, the Natron of the country to the west of the Delta of the Nile, and of the Lonar Lake described by the late Dr. Malcolmson,* have all been proved to

* The analyses were made in the Laboratory, and the specimens are deposited in the Museum of King's College.

consist of 3 Eq. of Carb′ to 2 of Soda; or Na O 38·55+C′ 39·76+Aq. 21·69=100. A solution of it may be obtained by heating Bicarbonate of Soda in solution to a temperature of 212°. The salt so called until lately in the L. P. has been proved by Mr. Everett to be a Bicarbonate, q. v. ; and Dr. Pereira has stated that by the process given a Bicarbonate will always be produced. This Lake Carbonate is probably, like Sesquicarb. Ammonia, compounded of the Carb. and Bicarb.

SODÆ BICARBONAS, L. E. D.

Bicarbonate of Soda. *Sesquicarbonate.* *F.* Bicarbonate de Soude. *G.* Zweifach Kohlensaures Natron.

The Bicarbonate of Soda ($NaO, 2\,C\,O_2, H\,O=85$) which is met with in commerce is usually a pure salt, but occasionally mixed with a small portion of the Carbonate. It exists in some mineral springs highly acidulated with Carb′, as in those of Vichy.

Prop. As usually sold, it is colourless, in powder, or in minute scale-like crystals, having a saline, slightly alkaline taste and reaction. Little changed in the air. Soluble in 13 parts of water at 60° (Rose and Geiger), but in much less boiling water. Hence it crystallizes as the hot solution cools. Heated, it first loses a portion of water, then half its Carb′, finally all its water, and becomes reduced to dried Carbonate of Soda. It is easily distinguished from this salt, *i.e.* the Carbonate, by its less alkaline taste, less solubility, and by not forming a white precipitate on the addition of Sulphate of Magnesia to its solution; nor is a brick-red precipitate formed with Bichloride of Mercury, but only a slight opalescence. It is made on the large scale by exposing cryst. of Carb. Soda to a continuous current of Carb. Acid Gas. This they slowly absorb, evolving much heat and watery vapour. The L. P. of 1836, and the present E. and D. Pharm. prepare it by passing the gas through a solution of the Carbonate to saturation.

Prep. E. Take a glass jar open at the bottom and tubulated at the top, close the bottom in such a way as to allow of the free ingress of a fluid, fill the jar with fragments of *Marble* and immerse it in a vessel containing dilute *Mur′*, then fill the apparatus with *Carb′ gas;* connect the tubulature closely by a bent tube with an empty bottle, and this in like manner with another filled with *Carb. of Soda*, 1 part, and *dried Carb. Soda*, 2 parts, well triturated together, and let the tube be long enough to reach the bottom of the bottle. Let the action go on till next morning, or till the salt no longer absorbs gas. Remove the damp salt which is formed, and dry it in the air, or without greater heat than 120°. D. Similar.

Tests. Entirely soluble in water. This solution should not be precipitated by Chlor. Platinum, or by the other tests for Potash, showing the absence of this alkali. The absence of Sulphates and Chlorides is proved by Chlor. Barium and Nitr. Silver causing no precipitate in a solution saturated with Nitr′. It is most liable to contain a portion

of Carb. Soda. This will, of course, give to it a stronger alkaline reaction and a more disagreeable taste. Its presence is detected by Sulph. Magnesia producing a white precipitate, whereas none is found in sol. of the Bicarb. unless when heated. "A solution of 40 parts of water does not give an orange precipitate with solutions of Corrosive Sublimate," E., unless with the aid of brisk agitation, long standing, or heat, but a reddish-brown precipitate forms at once if so much as a hundredth part of the Carb. be present. (*c.*) 100 grs. of this salt, added to dilute Sulphuric Acid, evolve 51·7 grains of Carbonic Acid. (L.)

Inc. The same as the Carbonate, except Sulph. Magnesia, with which it may therefore be prescribed.

Action. Uses. Antacid, Antilithic, Diuretic.

D. gr. x. to ʒß or ʒj. For making effervescing draughts, ℈j. = 17 grs. Cit′ or 18 grs. Tar′.

Trochisci Sodæ Bicarbonatis, E. Soda Lozenges.

Prep. Pulverize *Bicarb. Soda* ℥j., *Pure Sugar* ℥iij., *Gum Arabic* ℥ß., beat them into a proper mass for making lozenges with mucilage.

Pulveres Effervescentes, E. Pulveres Effervescentes Tartarizati et Citrati, D. Soda Powders.

Prep. E. Take of *Tart′* ℥j., *Bicarb. Soda* ℥j., and gr. 54, or *Bicarb. Potash* ℥j. and gr. 160. Powder the acid, and either Bicarbonate finely; divide each into 16 powders. Preserve the acid and alkali powders in different coloured papers.

D. Similar: for the Citrated powders the quantity of acid ordered is 1-10th less than the quantity of Tartaric′ in the others. (Of cryst. *Tart′.* ʒx. avoird., of cryst. *Citric′* ʒix. to ʒxi. of *Bicarb. Soda.*)

These are the common Soda powders, for which we may also take of either Bicarb. of Soda or Potash ℈j. and dissolve in Aq. f℥jß—f℥iij. in a tumbler, and add ½ oz. of Lemon-juice, or of Tar′ or Cit′ gr. xviij. dissolved in a little water, and drink while in a state of effervescence: a Citrate or Tartrate of Soda or of Potash will be formed. By adding ʒj. or ʒij. of Rochelle Salt, or Sulphate of Magnesia, an aperient salt may be presented in the agreeable form of an effervescing draught. It must be remembered that Citrates and Tartrates become converted into Carbonates, and will, if long taken, have an alkaline reaction on the secretions, as on that of urine.

Aqua Sodæ Effervescens, E. Soda Water.

Prep. Dissolve *Bicarb. of Soda* ʒj. in one pint of distilled water, and pass into it, under strong pressure, a current of *Carbonic Acid* gas (obtained from Marble and Mur′ diluted with 8 waters) more than is sufficient to saturate it, and keep it in a well-stoppered vessel.

Soda-water should be of this composition; but what is commonly so called is only a solution of Carb′ gas in water. By adding some Bicarb. Soda to such Soda-water, an equally efficient mixture will be

formed. But the effects of the simple Carb′ gas in water and those produced when it is combined with an alkaline salt will necessarily be different. The Carb′ gas as it escapes will stimulate the stomach, while this effect will be followed by an alkaline reaction when Soda (or Potash) is present, and this may be beneficial or injurious according to the nature of the case.

Carbonic Acid gas is found in many mineral waters, to which it gives an acidulous taste and sparkling effervescence. In some it occurs with Carbonate or Bicarbonate of Soda, in others with Iron, and its effects are necessarily modified according to the nature of these ingredients.

Sodii Chloridum, L. D. Sodæ Murias Purum, E.

Chloride of Sodium. *Muriate of Soda. Sal Fossile. Sal Marinum, Sal Gemmæ. F.* Chlorure de Sodium. *G.* Chlor Natrium.

Chloride of Sodium ($Na\,Cl=60$), or Common Salt, is abundantly diffused in nature, and, being an essential article of diet, must have been known from the earliest ages. It is found in many animal solids and fluids, and in the juices of some vegetables. It exists in large quantities in the solid form as Rock Salt, in solution in some springs, and everywhere in sea-water. From these waters it is obtained by evaporation, when it crystallizes with slight variations of appearance according to differences in the process. These varieties are known by different names in commerce, as Butter, Stone, and Basket Salt, also Sea Salt, and, in large crystals, as Malden, Fishery, and Bay Salt. Most of the kinds of Salt require purification, by being again dissolved and recrystallized (Sodæ Murias Purum, E.), for they are apt to contain other salts, as alkaline and earthy Sulphates and Chlorides, especially of Magnesium and of Calcium.

Prop. Common Salt crystallizes in anhydrous transparent cubes; these are sometimes aggregated together, forming hollow four-sided pyramids with their sides in steps. Sp. Gr.$=2{\cdot}17$; colourless when pure. Taste saline, well-known; no odour; it does not affect either Litmus or Turmeric. Neither does it bleach. 1 part requires $2\frac{1}{2}$ times its weight of water to dissolve it, and its solubility is not much increased by a boiling temperature. It is insoluble in pure Alcohol, but slightly soluble in rectified Spirit, to the flame of which it gives a yellow tinge. Salt readily transmits radiant heat. When heated, it decrepitates; at a red heat, fuses and sublimes. Inalterable in the air when pure; but when impure, it deliquesces. Sul′ and Nit′ decompose Salt, as also Bor′ and Phosp′ with the assistance of heat. Nitr. Silver, the Protoxides of Lead and Mercury, Lime, Potash, and with the aid of heat, Carb. Potash, all decompose this salt. When dissolved in water, it is supposed by some chemists to become a Hydrochlorate of Soda, from the water being decomposed, its Oxygen

combining with the Sodium, and the Hydrogen with the Chlorine; then its composition will be Na O, H Cl = 69. Salt is composed per cent. of Na 40 + Cl 60 = 100.

Tests. Scarcely any precipitate should be occasioned by Carb. Soda or Nitr. Bar.; the first indicating the absence of earthy salts, and the latter of Carbonates and Sulphates. (It often contains a little Sulphate of Magnesia, sometimes also a Chloride of Magnesium, by which it is rendered deliquescent). A solution is not precipitated by Sol. Carb. Am. followed by Sol. of Phosph. Soda. The former would detect Lime, and, after its addition, the latter would indicate Magnesia. "9 grs. dissolved in distilled water are not entirely precipitated by a sol. of 26 grs. of Nitr. Silver," E.

Action. Uses. Stimulant, irritant externally, Emetic, Cathartic; has been used also in Ague, and in malignant Cholera.

D. gr. x.—ʒj. as a Stimulant. ʒiv.—℥j. Cathartic. ℥jß—℥ij. with warm water, as an Emetic. lbj. of Salt to every 3 gallons of water, will make a bath of the strength of sea-water.

Pharm. Prep. Pulv. Salinus Comp. E. p. 90.

Liquor Sodæ Chlorinatæ, L. D.

Solution of Chlorinated Soda. Hypochlorite of Soda. Chloride of Soda. Labarraque's Soda Disinfecting Liquid. *F.* Chlorure de Soude. Chlorure d'Oxyde de Sodium. *G.* Chlornatron.

M. Labarraque in 1822 made known the utility of Chlorinated Soda as a disinfectant, &c., and obtained the prize of the French Society for encouraging national Industry for proposing it as a means for preventing, stopping, and destroying putrefaction.

Prop. The comp. of this substance is probably of a definite nature, for the solution, by careful evaporation, yields crystals, which, when redissolved in water, produce a solution similar to the original one. This is of a pale yellowish colour, has a slight odour of Chlorine, and a sharp but somewhat astringent taste. It has first an alkaline reaction on Turmeric paper, from the presence of Carbonate of Soda, and subsequently destroys its colour, as well as that of Sulphate of Indigo. Exposed to the air, it becomes decomposed, Chlorine being evolved. Carbonate of Soda is left. Chlorine as well as Carb′ gas is evolved on the addition of acids, Chloride of Sodium being left in solution. Lime-water produces a white precipitate, indicating the presence of Carb′. It may be distinguished from Chlorinated Potash by Chloride of Platinum not producing the usual yellow precipitate, and from Chlorinated Lime by Oxalate of Ammonia causing no precipitate. The term Chloride of Soda, which has been applied to this substance, would, if strictly understood, indicate a compound to which we know of no parallel in Chemistry. Chemists are not unanimous as to its real constitution, and thus, as the composition is uncertain, the London

College have adopted the name of Chlorinated Soda. The most generally received opinion, and that adopted by Dr. Pereira, is, that it is composed of 2 Eq. Bicarb. of Soda, 152 + 1 Eq. Hypochlorite of Soda, 76 + 1 Eq. Chloride of Sodium, 60 = 288.

Prep. L. Dissolve *Carb. Soda* ℔j. in *Dist. Water* f℥xlviii.; then put *Chlor. Sodium* ℥iv. and *Binox. Manganese* ℥iij., both rubbed to powder into a retort, and add to them *Acid Sulph.* f℥iiß. (diluted with f℥iij. of *Water*, and cooled). Heat the mixture, and pass the Chlorine gas first through f℥v. of *Water*, and then through the solution of the *Carbonate.* D. P. prepares it by decomposing a solution of Chlorinated Lime with one of Carbonate of Soda. The Carbonate Lime is separated by filtration.

The changes taking place in the L. mode of preparation may perhaps be represented by the following equation :

$$4\ (Na\,O,\ C\,O_2) + 2\ Cl = 2\ (Na\,O,\ 2\ C\,O_2) + Na\,O,\ Cl\,O + Na\,Cl.$$

If instead of Carbonate of Soda we employ Carb. Potash, we shall have the *Eau de Javelle* or *Chlorinated Potash*, first employed in bleaching in 1789, but little used in medicine.

Action. Uses. Disinfectant and Antiseptic. Stimulant.

CATAPLASMA SODÆ CHLORINATÆ, L. Poultice of Chlorinated Soda.

Prep. Add *powdered Linseed* ℥ivß. to *boiling Water* f℥vj., then mix in *Solution of Chlorinated Soda* f℥ij., stirring constantly.

Use. An excellent application to foul sores and sloughing ulcers, destroying their fœtor.

SODÆ BIBORAS, L. D. Borax, L. E. D.

Biborate of Soda. *Borate of Soda.* *F.* Borax. Borate de Soude. *G.* Boraxsaures Natron.

Fig. 16.

Borax or ($Na\,O,\ 2\ B\,O_3 + 10$ Aq. = 192) Biborate of Soda, is supposed to have been known to the ancients, and to have been the *Chrysocolla* of Pliny. The Hindoos have long been acquainted with it; it is their *Sohaga*, Sanscrit *Tincana*, and one of the kinds of *Booruk* of the Arabs. Its nature was first ascertained by Geoffroy in 1732. It is produced by spontaneous evaporation on the shores of some lakes in Thibet, that is, in the same country with Musk and Rhubarb; brought across the Himalayan Passes into India, and imported into this country by the names of *Tincal* and *Crude Borax.* It is also obtained by saturating the Bor′ of Tuscany (p. 40) with Carb. Soda.

Prop. Crude Borax is in pale greenish pieces, covered with an earthy coating, and feels greasy to the touch. The natives of Thibet are said to cover it with some fatty matter, to prevent its destruction by efflorescence. It is purified by calcining, which destroys the fatty matter, or by washing with an alkaline ley, which converts it into a soap, then dissolving and re-crystallizing. It crystallizes in irregular hexahedral prisms, often terminated by 2—4 converging planes. Sp. Gr. 1·35. It is colourless, transparent, somewhat shining; taste sweetish, a little styptic, and subalkaline. It has an alkaline reaction on Turmeric. The crystals effloresce slightly in the air, are soluble in 12 parts of cold and 2 of boiling water. When heated, they lose water, swell up into a porous substance called *Borax usta v. calcinata*, and at a red heat run into transparent glass, called *Glass of Borax*, much used as a flux. Another variety, more useful in the arts, contains only 5 Eqs. Aq., and crystallizes in octohedra, which are permanent in the air. Borax increases the solubility of Cream of Tartar, (p. 96), and converts mucilage of Lichen and of Salep into a thick jelly. Comp. Na O 16·0 Bor′ 35·79 Aq. 47·37 = 100.

Tests. Not liable to adulteration. Totally soluble in water. Gives a green colour to the flame of Alcohol. Sul′ precipitates scales of Boracic′ from a concentrated solution, Sulph. Soda being left in solution. L. E.

Inc. Acids, Acid Salts, Potash, Chlorides of Lime and of Magnesia.
Action. Uses. Sub-Astringent, Detergent, Diuretic, Emmenagogue.
D. gr. v.—ʒß. ʒij. in Aq. f℥vj. as a lotion.

Mel Boracis, L. E. D. Honey of Borax.

Prep. Mix *Borax* powdered ʒj. with *Honey* clarified ℥j.

Action. Uses. Subastringent, Detergent. Applied to Aphthæ, and to ulcers of the inside of the mouth.

Sodæ Sulphas, L. E. D.

Sulphate of Soda. *Natrum Vitriolatum. Sal Catharticus. Sal Mirabile Glauberi. F.* Sulphate de Soude. *G.* Schwefelsaures Natron.

Sulphate of Soda (Na O, S O_3 + 10 Aq. = 162), or Glauber's Salt, is found effloresced on the soil in some countries, as in India, where it is called *kharee nimuk* or *kharee noon.* It exists in sea-water in that of some lakes and mineral springs, also in Glauberite. It is found in the ashes of many plants, and in some animal secretions.

Prop. Fresh prepared, it is transparent and colourless, without colour, but having a nauseously bitter taste. It crystallizes in four and six-sided oblique rhombic prisms, often with dihedral summits. An anhydrous variety crystallizes in rhombic octohedra. 3 parts of water at 60° dissolve one of the salt; the solubility increases to 92°,

and then diminishes to 215°, at which point the salt is only as soluble as at 87°; boiling water dissolves its own weight; it is only very slightly soluble in Alcohol. In the air the crystals effloresce; if heated, they first melt in their water of crystallization, then lose half their weight, and fall into a white powder. Heated with Carbon, the salt is converted into Sulphuret of Sodium. The solution is decomposed by salts of Baryta, Lime, and Lead, insoluble Sulphates being precipitated. Comp. Na O 19·75 S′ 24·69 Aq. 55·56=100.

Sulphate of Soda is largely prepared by the action of Sul′ on Common Salt (p. 100), and is a residual Salt in several manufacturing processes (pp. 52 and 74). The E. P. gives a formula.

Prep. L. E. D. Dissolve of the salt remaining after the distillation of *Mur′* ℔ ij. in boiling *Aq.* Oiij. Add powdered *white Marble*, q. s. till effervescence ceases. Filter, wash the insoluble matter, returning the water to the original liquid. Evaporate till a pellicle begins to form, then let the liquor cool and crystallize.

In the preparation of H Cl, by acting with Sul′ on Chloride of Sodium, Sulph. Soda is produced. But as there is always an excess of acid, it is neutralized by the Carbonate of Lime, the Carb′ escaping; some insol. Sulph. Lime is formed, from which the soluble Sulphate of Soda is easily separated.

Tests. Not liable to adulteration. Exposed to the air, it falls to powder. 100 parts lose 55·5 parts by a strong heat. Totally dissolved by water; very slightly by Alcohol, (insol. *Phillips*). It does not alter the colour of Litmus or Turmeric. Nitr. Silver throws down scarcely anything (unless Chlorides be present) from a dilute solution; From the solution in Dist. Water of 100 grains, Chloride, Barium, and Hydrochloric′ being added, 71 grains of Sulphate of Baryta, (to be dried at a red heat), are prepared. L. The presence of Iron may be detected by Ferrocyanide of Potassium, or by Tincture of Galls, and of Copper by the blue colour produced by Ammonia.

Inc. Carb. Potash, Chloride Calcium, Barytic Solutions, Acetate and Diacetate of Lead.

Action. Uses. Purgative. Often called CHELTENHAM SALTS.

D. ʒiv.—℥j. or ℥ij. ʒiij.—ʒiv. of the effloresced or anhydrous salt.

SODÆ PHOSPHAS, L. E. D.

Phosphate of Soda. Rhombic Phosphate of Soda. *Tasteless Purging Salt. Sal Mirabile perlatum.* Triphosphate of Soda and Basic water (Turner), or Common Tribasic Phosphate of Soda. *F.* Phosphate de Soude. *G.* Phosphorsaures Natron.

Phosphoric Acid ($P\ O_5$) being tribasic, it is combined in this salt with 2 Eq. of Soda, and 1 of Basic water. The crystals contain besides this 24 Eq. of water of crystallization. ($2\ Na\ O,\ PO_5,\ H\ O = 145, + 24\ Aq. = 361.$) It is used in metallurgy, and was introduced into practice by Dr. Pearson about 1800. It was found in

Urine by Hellot in 1737, and analysed by Marcgraff in 1745. It is also found in the Serum of the blood, and in other animal secretions; it is obtained from bone-ashes.

Prop. Phosphate of Soda is colourless, transparent, and of a cool saline taste. It crystallizes in large oblique rhombic prisms. Sp. Gr. 1·5. Soluble in four times its weight of cold and in twice its weight of boiling water; but not in Alcohol. The crystals effloresce in the air; when heated, they undergo aqueous fusion, and then lose water, and at a red heat melt into a greenish-coloured glass, opaque when cool. Phosphate of Soda has a slight alkaline reaction. Solutions of Acetate of Lead and of Chloride of Barium produce white precipitates (Phosphates). Nitr. Silver throws down a yellow precipitate (Phosphate of Silver), unless the Phosphate has been previously heated to a red heat, and become bibasic Phosphate of Soda; then a white Pyrophosphate of Silver is produced. All these precipitates are soluble in Nit′, and the last also in Ammonia. It is decomposed by the soluble salts of Lime, and also by those of Magnesia. In the latter case, if Ammonia be likewise present, a very insoluble triple compound is formed, the Ammoniaco-Magnesian Phosphate, one of the varieties of urinary gravel. It is not acted on, if moderately diluted, by Ammoniacal Nitrate of Silver; which constitutes a distinction between the actions of the Silver test on this salt and on Arsenic in solution. Phosphate of Soda, according to Professor Graham, consists of 1 Eq. of Phosph′, 1 of basic water, 2 of Soda, aud 24 of water of crystallization, thus constituting a Trisphosphate or Tribasic Phosphate of Soda and Water, as stated above. When subjected to a red heat, the basic water being expelled, 1 Eq. of acid remains combined with 2 of Soda, and forms a Bibasic or Pyrophosphate of Soda, the salt which melts into a glass. (2 Na O, P O_5.) Phosphate of Soda (like many other salts, found pure in commerce) is only in the list of Materia Medica in the L. P.

Prep. E. To the *Acid Phosphate of Lime* obtained by acting on *Bone-ash* with *Sul′*, as described at p. 38, and in the state of a clear liquid, which is to be heated to ebullition, add *Carb. Soda* q. s. dissolved in boiling water, until the acid be completely neutralized. Put the solution aside to cool and crystallize. More crystals may be obtained by successively evaporating, adding a little *Carbonate of Soda* till the liquid exerts a feeble alkaline reaction on Litmus paper. Preserve the crystals in well-closed vessels. D. Similar.

When the Carbonate of Soda is added to the solution of Superphosphate of Lime, Phosphate of Soda is formed, and remains in solution, Carb′ gas escaping, and Subphos. Lime being precipitated.

$$2\,(\mathrm{Ca\,O,\,2\,H\,O,\,P\,O_5}) + 2\,(\mathrm{Na\,O,\,C\,O_2}) = (2\,\mathrm{Na\,O,\,H\,O,\,P\,O_5}) + (2\,\mathrm{Ca\,O,H\,O,P\,O_5}) + 2\,\mathrm{C\,O_2} + 2\,\mathrm{H\,O}.$$

Tests. If the precipitate made by Chlor. of Barium is insoluble in Nit′, a Sulph., probably of Soda, is present; if that by Nitr. Silver is so, then a Chloride is present. Carb. Soda is sometimes used in excess,

especially as fine crystals are then more easily obtained : its presence is readily detected by its effervescing with acids. 45 grs. dissolved in Aq. dest. f℥ij. and precipitated by a solution of 50 grs. Carbonate of Lead in f℥j. of Pyroligneous acid, will remain precipitable by solution of Acetate of Lead. E. P.

Inc. Calcareous and Magnesian Salts; many Metallic Salts, as Acetate of Lead, &c.

Action. Uses. Mild Saline Cathartic; less unpleasant than others. *D.* ℨiv.—℥j ß.

Solutio Sodæ Phosphatis, E.

Prep. Dissolve of *Phosphate of Soda* (free of efflorescence) 175 grs. in *Aq. dest.* f℥viij. and keep the solution in well-closed vessels. Employed only as a test.

Sodæ Potassio-Tartras, L. Potassæ et Sodæ Tartras, E. D.

Tartrate of Potash and Soda. *Soda Tartarizata. Tartarized Soda. Rochelle Salt. F.* Tartrate de Potasse et de Soude. *G.* Weinsaures Natron-Kali.

Tartrate of Potash and Soda (K O, Na O, C_8 H_4 O_{10}+8 Aq.= 284) was discovered in 1672 by Seignette, an apothecary of Rochelle. Hence it is called *Sel de Seignette*, also Rochelle Salt. The Colleges differ in naming this salt. It has most generally been ranked as a Soda salt in medical writings.

Fig. 17.

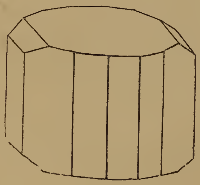
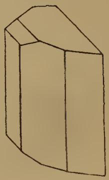


Fig. 18.



Prop. Colourless and without odour ; of a mild, saline, slightly bitterish taste. Crystals transparent, often very large, in prisms with ten or twelve unequal sides; usually seen in half-crystals having six unequal sides ; the primitive form is the right rhombic prism. They effloresce in a dry air, and, when heated, melt in their water of crystallization. The acid becoming decomposed, Carbonates of Potash and Soda are left with some Charcoal. This salt is soluble in 5 parts of water at 60°, and in less boiling water. It is readily decomposed by most acids and acidulous salts, except the Bitart. Potash. The acids combine with the Soda, and precipitate Bitart. Potash. It is also decomposed by the Acet. and Diacet. Lead, and likewise by the

soluble salts of Lime and of Baryta; but this is not apparent in a dilute solution. A white precipitate is also thrown down in a strong solution by Nitr. Silver (*p.*), which is soluble in an excess of water. This, therefore, like the former, is not perceptible in a dilute solution. Potash may be recognized by its peculiar tests, and when it has been precipitated, the Soda will be revealed by its tests.

Prep. E. Take of *Bitartrate of Potash* ℥xvj., and of *Carbonate of Soda* ℥xij., with *Water* Oiv. Dissolve, neutralize, and evaporate to crystals, in the same way as for Tartrate of Potash. D. Similar.

Tartaric acid is bibasic; in the Bitartrate it is combined with one Eq. of Potash, and one of water. On adding the Carb. Soda, this water is replaced by an Eq. of Soda, and the $C\,O_2$ escapes. As both the Carb. Soda and the Bitart. Potash are liable to vary in strength, it is better to add the latter to saturation, though it is preferable to have excess of Soda rather than of acid.

Tests. Not liable to much adulteration, from being sold in crystals; but both Bitart. Potash and Tart. Lime are sometimes present. It should be entirely and easily soluble in 5 parts of boiling Aq. The solution does not affect Litmus or Turmeric. S′ and H Cl occasion a crystalline precipitate in a strong solution (Bitart. Potash). 37 grains in solution are not entirely precipitated by 43 grains of Nitr. Lead. E. This will show the due proportion of Tart′, and consequently the absence of the mineral acids. The Chlor. Barium and Nitr. Silver employed by the London College require very dilute solutions. They then give no precip. L.

Inc. Acids and Acidulous Salts, Acet. and Diacet. Lead, &c.

Action. Uses. Cathartic, Diuretic.

D. ʒij.—℥j., or in effervescence, as in Seidlitz powders.

Sodæ Acetas, D.

Acetate of Soda. *Terra foliata Tartari crystallizata. Terra foliata Mineralis. F.* Acetate de Soude. *G.* Essigsaures Natron.

The Acetate of Soda ($Na\,O,\ C_4\,H_3\,O_3 + 6\ Aq. = 137$) is considered by Thomson to have been first described by Baron in 1747. It probably exists in many of the plants of which the ashes yield Carbonate of Soda. It is made in large quantities by the manufacturers of Pyroligneous acid, q. v.

Prop. When pure, a colourless salt, having a pungent rather bitter saline taste. It crystallizes in transparent, oblique rhombic prisms, or in striated needles, often seen in foliaceous masses. Sp. Gr. 2·1. Soluble in about 3 parts of water at 60°, and in its own weight of boiling water, and in about 24 parts of Alcohol. Exposed to dry air, it effloresces, losing about 40 per cent. of weight. Heat, cautiously applied, likewise expels its water of crystallization; but at a tempera-

ture of 600° the salt is decomposed, and at a red heat converted into the Carbonate with some Charcoal. Comp. Na O 23·36+A′ 37·22+Aq. 39·41=99·99.

Prep. Acetate of Soda is made on a large scale by saturating impure Pyroligneous acid with Chalk or Slaked Lime. The Acetate of Lime which is formed is decomposed by the requisite quantity of Sulphate of Soda. An insoluble Sulphate of Lime is precipitated, and Acetate of Soda remains in solution. This is decanted, evaporated, and crystallized. The crystals are still very impure and blackish coloured. They are purified by repeated solution, filtering, and crystallization.

The D. C. directs it to be made by saturating *Acet. Acid of commerce* with *Carb. Soda,* filtering and evaporating the fluid till a pellicle forms. Crystals are deposited on cooling, which are to be dried and kept in a close vessel.

Tests. Acetate of Soda is not liable to any great adulterations as made at present. It is soluble in water; slightly so in Alcohol. The solution does not affect Litmus or Turmeric; neither is it affected by Chlor. Barium (if no Sulph. be present), by Nitr. Silver (if no Chlorides), nor by Chlor. Platinum (if no Potash). Sul′ evolves an acetous odour. Heat converts it into Carbonate of Soda.

Inc. The strong Acids.

Action. Uses. Diuretic, Cathartic.

D. Diuretic, ℈j.—ʒij. Purgative, ʒj.—ʒiv.

SODÆ VALERIANAS. D. Valerianate of Soda.

Valerianate of Soda ($Na\,O, C_{10}\,H_9\,O_3=125$), is used by the D. C. in the preparation of the Valerianates of Iron, Zinc, and Quina. Valerianic′ may be prepared from the essential oil of Valerian (*v.* Valerianaceæ), or from Fusel oil, a compound obtained towards the end of the distillation of Potato-spirit. The latter source is adopted by the D. C.

Fusel oil ($C_{10}\,H_{11}\,O, H\,O$) is the hydrated oxide of an organic radical called Amyle ($C_{10}\,H_{11}$), and has chemically the same relation to Valerianic which Alcohol has to Acetic acid.

Valerianic acid ($C_{10}\,H_9\,O_3, H\,O$) is derived from Fusel oil by the abstraction of 2 Eq. of Hydrogen, and the addition of 2 of Oxygen. Bichromate of Potash and Sulph. acid, being distilled together with the oil, supply it with Oxygen. Thus,—

$$K\,O, 2\,Cr\,O_3+3\,S\,O_3=K\,O, S\,O_3+2\,(Cr\,O, S\,O_3)+4\,O.$$

Oxygen being thus furnished in a nascent state, acts upon Fusel oil, forming Valerianic′ and water.

$$C_{10}\,H_{11}\,O, H\,O+4\,O=C_{10}\,H_9\,O_3, H\,O+2\,Aq.$$

The acid is distilled over, neutralized with solution of Caustic Soda, and the resulting solution evaporated to dryness. The concrete Salt is broken up into fragments, and kept from the air.

Prop. It is, as thus made, a white amorphous compound, with a strong odour and taste of Valerian. It is deliquescent, and very soluble in water.

Use. Antispasmodic. Employed in the preparation of the other Valerianates.

ALKALINE-EARTHY METALS.

Barium.

Baryta was discovered by Gahn and Scheele about 1774, but obtained its name from *βαρυς*, *heavy*. Sir H. Davy discovered that it was the Oxide of a Metal, which he named Barium.

Barium ($Ba = 69$) is a brilliant silver-white metal; heavy, Sp. Gr. above 2; when heated, burning with a red light in the air, and decomposing water, combining in both cases with Oxygen, and forming an Oxide of Barium, or the earth Baryta.

Baryta. *F.* Baryte. *G.* Schwer-erde, or Baryt-erde.

Baryta or Barytes ($Ba\ O = 77$) is a porous substance, of a greyish-colour, devoid of odour, with a powerful caustic taste, alkaline reaction, corroding animal substances. Sp. Gr. 4. It combines eagerly with water, evolves heat, and becomes a Hydrate, which is not decomposed at a red heat; is with difficulty fused; insoluble in Alcohol, but soluble in 20 parts of cold and 3 of boiling water, forming Barytic water.

Tests. It may be detected by its alkaline reaction; and by the heavy white precipitates which it forms with S′ or the soluble Sulphates, and which are insoluble in water and Nitric acid.

Action. Uses. Baryta is an acrid caustic, and will act as a poison on the system.

Barytæ Carbonas, E. D.

Carbonate of Barytes. Terra ponderosa aerata nativa, Gm. *F.* Carbonate de Baryte. *G.* Kohlensaures Baryt.

Carbonate of Baryta ($Ba\ O, C\ O_2 = 99$) was described in 1784 by Dr. Withering, and named Witherite by Werner; it is rather common in Lancashire. It may be prepared in the form of a powder by decomposing Chlor. Barium by an alkaline Carbonate. In its native state it occurs massive with a fibrous structure, or imperfectly crystallized in a globular form, or in hexagonal prisms, or in pyramids.

Prop. It is hard, of a white or greyish colour, without odour or taste, with a vitreous lustre, and subtransparent. Sp. Gr. 4·29—4·3; nearly insoluble in water, unless there is excess of Carb′. The native

Carbonate is not decomposed by any heat, the artificial at a white heat in contact with carbonaceous matter. Comp. Ba 77·7 + C′ 22·3 = 100.

Tests. Carb. Baryta, if pure, should be entirely dissolved with effervescence in H Cl; any Sulph. Baryta present will remain undissolved. The solution of Chlor. Barium which has been formed does not give any precipitate on addition of Ammonia, showing the absence of Alumina. A brownish-yellow precipitate will indicate Iron; and H S throws down a black Sulphuret of Lead or Copper, or of Iron. Sul′ added in excess to the above solution, will precipitate the whole of the Baryta as a Sulphate; and if Carb. Soda is afterwards added, no precipitate should take place, to prove the absence of Lime. The E. P. states that 100 grs. dissolved in an excess of Nit′, are not entirely precipitated with 61 grs. of the anhydrous or 125 grs. of the crystallized Sulph. Magnesia.

Tests. Does not smell of Sulphuretted Hydrogen after ignition with Charcoal, nor effervesce with dilute N′.

Action. Uses. Carbonate of Baryta, though insoluble and tasteless, yet acts with considerable activity when introduced into the stomach of animals, probably from meeting there with acid, by which it is converted into a soluble salt. Officinal for the purpose of making the Chloride of Barium.

Barytæ Sulphas, E. D.

Sulphate of Baryta. *F.* Sulfate de Baryte. *G.* Schwefelsaures Baryt.

Sulphate of Baryta (Ba O, S O_3 = 117), or Heavy Spar, is more abundant as a mineral than the Carbonate. The finest specimens have been obtained from Dufton in Cumberland: the Author found it on the Himalayas, near the Convalescent dépôt at Landour. (v. Illustr. Himal. Bot. p. xxxiii.)

Prop. Heavy Spar may be found massive or crystallized, of a foliaceous or lamellar structure; white-grey, or with a reddish hue; often translucent; heavy; Sp. Gr. 4·41 to 4·67; without odour or taste; insoluble in water. Its crystals are often bevelled tables or flat prisms of six sides, and may be divided into right rhombic prisms. This salt is formed whenever Baryta meets with S′, in whatever state of combination either the earth or the acid may previously have been; and the Sulphate of Baryta being insoluble in Nit′, this is employed to test it. Hence this earth and its soluble salts are excellent tests for S′ and the Sulphates. It is double refractive, decrepitates briskly before the blowpipe, and is with difficulty fused, but eventually melts into a hard white enamel, which is not affected by acids. Sulphate of Baryta, when heated with carbonaceous matter, has its acid decomposed, and Sulphuret of Barium is formed. From this, various salts may be formed by operating with different acids, or it may be con-

verted into Carbonate of Baryta by heating it to a red heat with three parts of Carbonate of Potash. Comp. Ba O 66+S′ 34=100.

Action. Uses. Inert. Employed for making other salts, being cheap and usually pure.

Barii Chloridum, L. D. Barytæ Murias, E.

Chloride of Barium. *F.* Chlorure de Baryum. *G.* Chlor-Baryum.

Chloride of Barium (Ba Cl+2 Aq.=123), at one time called *Terra ponderosa Salita* and *Barytes Salita*, was discovered by Scheele in 1775. It is prepared from either the Barytic Carbonate or Sulphate.

Prop. By evaporation of its solution it may be obtained in rhombic plates, or flat or tabular quadrangular crystals with bevelled edges. Sp. Gr. 2·82. These, like the solution, are colourless and transparent, of an acrid and bitter, nauseous, disagreeable taste; efflorescent in the air when it is very dry; but in ordinary states, they are permanent. They produce no action on vegetable colours. Of these crystals 100 parts of water at 60° F. dissolve about 40 parts; but at the boiling point, 222° of a saturated solution, 78 parts are dissolved. They are slightly soluble in rectified Spirit, and in 400 parts of anhydrous Alcohol, which will then burn with a greenish-yellow flame. (Strontian salts burn red.) At a moderate heat the crystals decrepitate and lose their water of crystallization.

Prep. E. Take of *Sulph. Baryta* ℔j., *Charcoal* in fine powder ℥ij., pure *Mur′* q. s. Heat the Sulphate to redness; pulverize it when cold, and mix it intimately with the Charcoal; subject the mixture to a low white heat, for three hours, in a covered crucible; pulverize the product, put it gradually into boiling *Aq.* O v., and boil for a few minutes; let it rest for a little over a vapour-bath; pour off the clear liquor, and filter it if necessary, keeping it hot. Pour boiling *Aq.* O iij. over the residuum and proceed as before. Unite the two liquids, and while they are still hot, or if cooled, after heating them again, add pure *Mur′* gradually so long as effervescence is occasioned. In this process the solutions ought to be as little exposed to the air as possible; and in the last step the disengaged gas should be discharged by a proper tube into a chimney, or the ash-pit of a furnace. Strain the liquor, concentrate it, and set it aside to crystallize.

The D. C. (and L. of 1836) prepare it by directly decomposing the Carbonate of Baryta with H Cl.

In the E. process, the Carbon, taking the Oxygen from both the acid and the earth, escapes in the form of Carbonic Oxide, while the Sulphur, combining with the Barium, forms a Sulphuret of Barium. This is decomposed by the Hydrochloric acid, Chloride of Barium and Sulphuretted Hydrogen gas being produced.

$$\text{Ba S}+\text{H Cl}=\text{Ba Cl}+\text{H S}.$$

Tests. Sul′ and the Sulphates throw down the insoluble Sulphate of Baryta from the solution; so also it is precipitated by the soluble Phosphates, Carbonates, and Tartrates. Nitr. Silver gives a white precipitate (Chlor. Silver), which is soluble in Am., but insol. in Nit′.

Impurities are less apt to occur when this salt is made with the Sulphate than when made with the Carbonate. Apply the same tests.

The revised E. P. state that 100 grains in solution are not entirely precipitated by 100 grains Sulph. Magnesia.

LIQUOR BARII CHLORIDI, L. D. Solutio Barytæ Muriatis, E.

Prep. L. Dissolve *Chloride Barium* ʒj. in *Aq. dest.* f℥i. and strain. E. D. Same proportions.

It is inserted in the Appendix of the L. P. and used simply as a test for Sulphuric acid.

Inc. Common water, Solutions of Sulphates, Oxalates, Tartrates, Alkaline Phosphates, Borates, and Carbonates, Nitr. Silver, Acetates of Lead and Mercury, and Phosphate of Mercury.

Action. Uses. Acrid, Irritant, Stimulant, Deobstruent. Test to detect S′ and Sulphates.

BARYTÆ NITRAS, E.

Nitrate of Baryta. *F.* Nitrate de Baryte. *G.* Salpetersaures Baryt.

Nitrate of Baryta ($Ba\,O, N\,O_5 = 131$) finds a place in the E. P. on account of its utility as a pharmaceutic test in detecting some adulterations of officinal salts and acids.

Prep. This salt is to be prepared like the Muriate of Barytes (v. supra. Chloride of Barium) substituting pure Nit′ for the Mur′.

Prop. If the acid is strong, a congeries of crystals is formed; if dilute, the solution by evaporation affords crystals in octohedrons, or in small brilliant plates. The salt has a pungent and styptic taste. The crystals are anhydrous, permanent in the air; soluble in 10 or 12 parts of water at 60° and in 3 or 4 parts of boiling water. It decomposes by heat, and detonates feebly with combustible bodies.

SOLUTIO BARYTÆ NITRATIS, E. Solution of Nitrate of Baryta.

Prep. Dissolve *Nitrate Baryta* gr. xl. in *Aq. dest.* 800 grs. and keep in well-closed bottles.

Like the solution of the Chloride, gives a white precipitate with S′ and the Sulphates insol. in Nit′. Used in testing.

CALCIUM.

Lime, in its caustic state, was early known, being employed for making building mortar by the Egyptians, Hindoos, &c. Davy proved that it is an Oxide of a metal, which has been called Calcium, from

Calx. Calcium ($Ca=20$) is white, brilliant, decomposes water, and, when slightly heated, burns in the air, being converted into the Oxide of Calcium, or Lime.

Calx, L. E. Calx reeens usta, D.

Oxide of Calcium. Quicklime. Caustic or pure Lime. *F.* Chaux. *G.* Kalk. (Lime freshly prepared from Chalk, L.)

Prop. Lime ($Ca\,O=28$), in its pure form, is a greyish-white earthy-looking mass, moderately hard, brittle; Sp. Gr. 2·3 — 3·08; having an acrid alkaline taste; corroding animal substances. When fresh burnt, it absorbs both moisture and Carb′ from the air; it will abstract water from most bodies, and hence is often employed as a drying substance. Comp. $Ca\ 71{\cdot}42+O\ 28{\cdot}58=100$.

Fresh burnt and slaked Lime, though easily procured, is seldom pure enough for medical use.

Prep. E. Break White Marble into small pieces and burn it in a covered crucible, at a full red heat, for three hours.

White Carrara Marble, Calcareous Spar, Chalk, Shells, all yield good Lime. The heat being sufficiently great, the Carb′ is expelled, and about 56 per cent. of Lime left in a caustic state, and tolerably pure; but, if shells have been employed, mixed with a little Phosphate of Lime and Oxide of Iron. It must be kept well closed up.

Tests. Water being added, Lime cracks, falls to powder, and is slaked, forming Hydrate of Lime.

Calcis Hydras. Hydrate of Lime, or Slaked Lime.

This ($Ca\,O+H\,O=37$) is formed whenever water is sprinkled over caustic Lime: it is immediately absorbed with a hissing noise, the Lime splitting and crumbling into a dry, white, powdery Hydrate. It is capable of thus taking up about 31·0 of its weight of water, and at the same time disengaging so much heat, as to inflame wood. Comp. $Ca\,O\ 75{\cdot}68+$Aq. $24{\cdot}32=100$. It loses its water by the action of heat; but the Lime by itself is very infusible, though powerful as a flux for many earths and Oxides. When heated in the Oxy-hydrogen flame, it is intensely luminous, as in the Drummond's light. Acids combine with Lime, some forming very soluble salts, as H Cl, Ac′; while Ox′ and Phos′ form a nearly insoluble Oxalate and Phosphate. Its presence is readily detected in any solution by the milkiness produced by passing Carb′ gas through it, also by alkaline Carbonates and alkaline Sulphates, or by the addition of Ox′ or Oxalate of Ammonia. The Oxalate of Lime will be precipitated from a very dilute solution. Salts of Lime are not precipitated by a saturated solution of Sulphate of Lime; which distinguishes them from those of Baryta and Strontian. The Sulphate is slightly soluble. S′ does not form a precipitate in a dilute solution. Salts of Lime tinge the

flame of Alcohol orange. This hydrate is soluble in water, forming Lime-water.

Tests. Soluble without effervescence in H Cl. The solution does not precipitate with Ammonia—proving that neither Alumina nor Magnesia are present, nor Oxide of Iron, nor Silica.

Action. Uses. Used as a Masticatory in India with Betle or Pan. Caustic, Disinfectant.

Liquor Calcis, L. D. Aqua Calcis, E. Lime Water.

Prep. L. Take of *Lime* (fresh burnt) ℔ß., *Aq. dest.* Oxij. (The Lime being slaked, is put into a bottle with the rest of the water, and then well shaken together. Close the vessel and set aside, that the undissolved Lime may subside; pour off the clear liquor when it is required. It may be replaced with fresh water, agitating briskly as before, that a fresh supply may be ready.) E. D. Similar.

A simple solution of Lime in water; requiring to be kept in stoppered bottles, which are constantly filled, as it attracts C′ from the air, which by uniting with the Lime, forms a thin film of Carb. Lime at the surface; this afterwards precipitates in the form of white layers, but its place will be supplied by the undissolved Lime left in the bottle. Dalton ascertained that, contrary to the analogy of most bodies, *cold* water dissolved more of Lime than hot water: that is, water at 60°, $\frac{1}{778}$, and at 212°, only $\frac{1}{1270}$. Mr. R. Phillips ascertained that water near the freezing point took up about $\frac{1}{7}$ more than water at 60°, and nearly double that of boiling water.

A pint of water at		32°	dissolves	13·25	grains of Lime.
„	„	60°	„	11·6	„
„	„	212°	„	6·7	„

Tests. Lime-water is clear and transparent, without odour, but having a disagreeable alkaline taste; changes vegetable blues to green, and forms an imperfect soap with oils; when evaporated under the vacuum of an air-pump, imperfect six-sided crystals may be obtained of the Hydrate of Lime. A precipitate of the Carbonate may be formed by breathing into the solution through a glass tube.

Inc. Acids and Acidulous Salts, Alkaline Carbonates, Ammoniacal and Metallic Salts, Borates, and astringent Vegetable Infusions.

Action. Uses. Astringent, Antacid, Antilithic. Resolvent in glandular affections.

Pharm. Prep. Potassa cum Calce. Lime-water for Black and Yellow wash.

D. f℥ij.—f℥viij. three or four times a day.

Linimentum Calcis, L. E. D.

Prep. L. D. Agitate briskly together equal parts of *Lime Water* and *Olive Oil.* The E. C. uses *Linseed Oil.*

Both the oils are composed of Oleic and Margaric acids and Glycerine: when mixed with Lime-water, an Oleate and Margarate of Lime (Calcareous Soap) are formed. It has long been employed as an application to burns and scalds, and employed for this purpose at the Carron Works,—hence often called Carron oil. Turpentine is sometimes added with advantage. Dr. Christison describes it as a Lime Soap with an excess of Linseed Oil; for when allowed to rest, the mixture separates into a white soap and a supernatant clear oil.

Calcis Carbonas.

F. Carbonate de Chaux. Craie. *G.* Kohlensaurer Kalk.

The Carbonate of Lime ($Ca\ O, C\ O_2, =50$) is one of the most widely diffused of minerals, and must have been one of those most anciently employed in the arts, and likewise in medicine. Found in a great variety of forms; forming mountain masses, either crystalline, as Marble and Calc Spar, or compact, as Limestone; in both stratified and unstratified rocks, and as Chalk in great beds, as the newest of the secondary strata. It is also extensively diffused in particles throughout the soil, which by segregation become united into roundish or botryoidal masses, or it may become dissolved by water (when holding in solution Carb. Acid), and is found in most springs, from which it is again deposited in a stalactical form. It is found in the ashes of most plants, from the vegetable acids with which it was combined being converted into the Carbonic′ during the process of incineration. Carbonate of Lime forms a constituent of the bones of Vertebrata, and a large part of the shells of testaceous Mollusca, of Crustacea, and of Corals. Hence Oyster-shells, Crab's-claws, Crab's-eyes, as they are called, and Corals, have all been employed in medicine, as formerly the *lapis judaicus*, which is the spine of a fossil echinus. All consist of Carbonate of Lime, with some animal matter intimately intermixed, and sometimes a little Phosphate of Lime. Carb. Lime is found crystallized in a variety of forms, but the primitive form is an obtuse rhomboid, and that of Arragonite a rectangular prism. Many varieties are transparent, and remarkable for doubly refracting the rays of light, especially Iceland Spar. It has been artificially crystallized by Prof. Daniell in acute rhombic crystals, which contained 5 per cent. of water. It is very sparingly soluble, 1 part requiring 1600 of water. But if an excess of Carb′ be present, it is readily dissolved, and is hence found in many mineral waters, from which it is again precipitated on the escape of the C′. The solution reddens Litmus-paper, but changes the yellow colour of Turmeric-paper to brown (*p.*). Heated in the air, Carb. Lime loses 44 per cent. of C′, Lime being left; but if heated in close and strong vessels, no change is produced, and, on cooling, artificial Marble is produced, as was done by Sir J. Hall. Bucholz fused it even without compression, in parts to which

the access of air was prevented. Carb. Lime is readily decomposed by the acids with strong effervescence, forming soluble salts with $N\ O_5$ and $H\ Cl$, and insoluble ones with $S\ O_3$. It may be formed

Fig. 19.

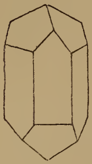
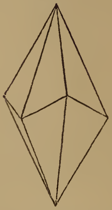


Fig. 20.



artificially by adding Carb′ to Lime-water, or by decomposing any soluble salt of Lime (or the Chlor. Calcium) with the Carbonates of the alkalis. Comp. $Ca\ O\ 56 + C\ O_2\ 44 = 100$.

Calcis Carbonas dura. Marmor, E. Marmor Album, D. Marble.

Marble is officinal for yielding Carb′ gas (p. 58) by the action of stronger acids. It has a glimmering appearance, from the lamellæ of minute crystals intersecting each other in every direction. Pure white Marble is intended ; that of Carrara, commonly called Statuary Marble, is the purest variety.

Tests. Marble should dissolve with effervescence in dilute H Cl without residue, proving the absence of Silica and some other impurities. In this solution, Ammonia ought (even after boiling) to cause no precipitate, if neither Magnesia (a constituent of some Limestones), nor Alumina, nor Oxide of Iron, (the most common impurities), are present. Neither ought it to be decomposed by a solution of Sulphate of Lime in water; if any precipitate appears, it must be Sulphate of Baryta or of Strontian.

Calcis Carbonas friabilis. Creta, E. D. Chalk.

Chalk is well known as an extensive secondary formation, of a dull white earthy appearance ; tasteless, but adhering to the tongue ; usually friable, sometimes hard ; Sp. Gr. 2·3; but either variety may be employed, though the softer is usually preferred for medical use. Its chemical characters are the same as those of Marble. In the arts it is commonly known by the name of *Whiting,* which is Chalk ground in a mill, and the grosser impurities separated by sinking in water, while the pure Chalk, being suspended, is allowed to settle, and made into small loaves. For medical use, it is similarly but more carefully prepared by the process of levigation, and in drying is made up into small conical masses.

CRETA PRÆPARATA, L. E. D. Prepared Chalk.

L. Mat. Med. Friable Carbonate of Lime, rubbed into the finest powder, and washed.

Prep. E. Take any convenient quantity of chalk; triturate well in a mortar with a little water; then pour it into a large vessel nearly full of water, and agitate briskly; allow it to rest for a short time, and pour the milky water into another vessel, in which the finely suspended chalk is to be left slowly to subside; repeat this process with the coarsely powdered chalk which subsided quickly in the first vessel; collect the fine powder in the second vessel on a filter of linen or calico, and dry it. D. Similar. Oyster shells, first freed from impurities and washed with boiling water, may be prepared in a similar manner, forming the TESTÆ PRÆPARATÆ, L. 1836.

Tests. (*v.* supra.) E. P. "A solution of 25 grs. in f℥x. of Pyroligneous acid (according to Mr. Phillips, this is capable of dissolving 4 times the above quantity of Chalk), when neutralized by Carbonate of Soda, and precipitated by 32 grs. of Oxalate Ammonia, continues precipitable after filtration by more of the test." Dr. Christison, states that a considerable excess of acid is useful. A little Lime is left unprecipitated if there be 90 per cent. of pure Carbonate of Lime in the Chalk; and this slight excess of Lime is indicated by adding more Oxalate of Ammonia to the filtered liquor.

Inc. Acids and Acidulous Salts, as other Carbonates.

Action. Uses. Antacid, Absorbent, Desiccant; from allaying irritation, apparently Astringent. If long used, care must be taken that it does not accumulate in the intestines.

D. gr. x.—℈j.; but usually given in some of the following preparations.

Pharm. Prep. Hydrargyrum cum Creta. Prepared Oyster Shells also contain Carbonate of Lime.

CALCIS CARBONAS PRECIPITATUM, D. Precipitated Carbonate of Lime.

This is still more finely divided than the above, and is prepared by precipitating a cold solution of Chloride of Calcium with a solution of the commercial Carbonate of Soda.

MISTURA CRETÆ, L. E. D. Chalk Mixture.

Prep. L. Take *Prepared Chalk* ℥ß., *Sugar* ʒiij., *Mixture of Acacia* f℥iß., *Cinnamon water* f℥xviij. Mix. E. D. Similar.

Action. Uses. Antacid, Demulcent. Much employed in Diarrhœas arising from acidity.

D. f℥ß.—f℥ij. every three or four hours.

PULVIS CRETÆ COMPOSITUS, L. E. D. Compound powder of Chalk.

Prep. L. Reduce separately to fine powder *Prepared Chalk* ℔ß., *Cinnamon* ℥iv., *Tormentil root* and *Gum Arabic* āā ℥iij., and *Long Pepper* ℥ß. Mix well. E. D. Similar: but both order *Nutmeg*, and neither include *Tormentil* or *Long Pepper.*

Action. Uses. Antacid, Stimulant, and Astringent. In Diarrhœas of low states of the Constitution.

D. gr. v.—℈j.

TROCHISCI CRETÆ, E. Chalk Lozenges.

Prep. Reduce to powder *Prepared Chalk* ℥iv., *Gum Arabic* ℥j., *Nutmeg* ʒj., *Pure Sugar* ℥vi., beat with water into a proper mass for making lozenges.

Action. Uses. Antacid. Useful in acidity of the prima viæ.

PULVIS CRETÆ COMPOSITUS CUM OPIO, L. Pulvis Cretæ Opiatus, E. D.

1 grain of Opium in 40 grains of the Compound Chalk Powder, L. *v.* OPIUM.

CONFECTIO AROMATICA, L. Aromatic Confection.

Prep. Rub into a very fine powder *Cinnamon* and *Nutmegs* āā ℥ij., *Cloves* ʒj. *Cardamoms* ℥ß., *Saffron* ℥ij., *Prepared Chalk* ℥xvi., *Sugar* ℔ij. Keep in a close vessel, and whenever the confection is to be used add fʒij. of *water* to each ounce, and mix all well together.

Action. Uses. Antacid and Cordial. Useful in Diarrhœas, and an excellent addition to Rhubarb and Magnesia, and such powders, for children.

D. gr. v. or gr. x.—ʒj.

CALX CHLORINATA, L. E. D.

Chlorinated Lime. Hypochlorite of Lime. Chloride of Lime. *Oxymuriate of Lime.* Bleaching Powder. *F.* Chlorure de Chaux. *G.* Chlor Kalk.

This substance was first prepared by Messrs. Tennant and Mackintosh in 1798. The exact nature of the compound not having been satisfactorily determined, the present name has been assigned it in the L. P., though it is very commonly called Chloride of Lime, or Bleaching Powder.

Prop. Chlorinated Lime is a dry pulverulent substance, of a greyish colour, with a hot, penetrating, bitter taste, a weak odour of Chlorine, more perceptible when the powder is shaken. When well prepared, it is very soluble in water; but commonly a considerable portion (of Lime) remains undissolved. In the atmosphere the Carb′, or any of the other acids, sets free the Chlorine (or Hypochlorous acid), and a Carbonate of Lime is formed, with some Chloride of Calcium, which causes deliquescence. Heat also expels Chlorine, and Oxygen. The strongest solution has a density of 1·040. (Ure.) It is of a pale yellow colour, has a slight smell, which some say, is the smell of Chlorine, while others (as Pereira) attribute it to Hypo-

chlorous acid. This solution is remarkable for its bleaching and disinfecting properties. The addition of a little acid increases its activity for such purposes.

The composition of this substance cannot be regarded as quite determined. It seems to vary somewhat. Some Chemists, as Ure and Thomson, regard it as containing really a compound of Chlorine with Lime. ($Ca\,O, Cl$). But this view is opposed to chemical analogy, and does not gain ground. The explanation adopted both by Phillips and Pereira of this compound (as well as of Chlorinated Soda), seems the more reasonable of the two. These, as well as Balard and Gay Lussac, consider it to be a compound of Hypochlorite of Lime with Chloride of Calcium, (1 Eq. of each). The difference is this. In preparing Soda Chlorinata, 4 Eq. of Carb. Soda, and 2 of Chlorine are employed. 2 Eq. of Bicarb. Soda, 1 of Hypochlorite, and 1 of Chlor. Sodium, result. (*Vide* Soda Chlorinata.) But here, instead of Carb. Lime, 2 Eq. only of pure Lime seem to be required, and 2 of Chlorine gas. 1 of Hypochlorite Lime and 1 of Chlor. Calcium are formed, but no Bicarbonate. (*Vide Infrà.*) Thus:

$$\text{Soda Chlorinata} = Na\,O,\ Cl\,O + Na\,Cl + 2\,(Na\,O,\ 2\,C\,O_2).$$
$$\text{Calx Chlorinata} = Ca\,O,\ Cl\,O + Ca\,Cl.$$

The two preparations are similar, but not alike.

Chloride of Lime is easily obtained, being largely prepared as a Bleaching Powder. Slaked Lime is spread out on a pile of wooden trays in a chamber built of sandstone, (the joints being secured by a cement of Pitch, Resin, and dry Gypsum,) into which the Chlorine is transmitted until the Lime is saturated. A larger quantity of Chlorine is absorbed when about 15 per cent. of water is previously added to the Lime, and the Lime is occasionally raked up.

Adopting the above explanation, we must suppose that the Lime gives part of its Oxygen to the Chlorine; by which some Hypochlorous acid is produced, and Hypochlorite of Lime and Chloride of Calcium formed.

$$2\,Ca\,O + 2\,Cl = Ca\,O,\ Cl\,O + Ca\,Cl.$$

But there is very commonly an excess of Lime, which is more insoluble than the rest.

Tests. Dissolves in dilute $H\,Cl$, emitting Chlorine. L. Greyish-white, dry; 50 grs. are nearly soluble in Aq. f℥ij., forming a solution of the density 1·027; of this, 100 measures, treated with an excess of Ox′, give off much Chlorine, and if then boiled and allowed to rest 24 hours, yield a precipitate which occupies 19 measures of the liquid. E. The precipitate is Oxalate of Lime, and the E. C. desire to have the goodness of Chloride of Lime ascertained by the amount of this precipitate, as well as by the density of the solution. But this method does not detect the amount of Chloride of Calcium, which is the most common adulteration (in excess). Dr. C. remarks that pro-

bably the simplest criterion of quality is the amount of Chlorine gas evolved by a strong acid, as originally proposed by Dr. Ure. (Chlorine gas is evolved with any strong acid. SO_3 being added, for example, it sets free Hypochlorous′ from the Hypochlorite, and H Cl from the Chloride Calcium. These acids (Cl O and H Cl), react on each other, H unites with O to form water, and 2 Cl are set free.)

Action. Uses. Irritant, Stimulant, Disinfectant, Antiseptic ; in solution as a lotion and gargle.

D. Internally gr. j.—gr. v. Used in Tooth-powders, Lozenges. Ointment, ʒj. with ℥j of Lard.

Liquor Calcis Chlorinatæ, D.

lbfs Avoird. in water Cfs; used in Scabies.

Calcii Chloridum, L. D. Calcis Murias, Crystallizatum, E.

Chloride of Calcium. Hydrochlorate or Muriate of Lime. *F.* Chlorure de Calcium. Hydrochlorate de Chaux. *G.* Salzsaurer Kalk.

This salt, often called Muriate of Lime, was known, according to Dulk, as quoted by Dr. Pereira, in the 15th century, and called *Sal Ammoniacum fixum*, being obtained by the decomposition of Sal Ammoniac by Lime. It is found in nature in Sea-water, and in many springs and mineral waters, sometimes associated with Nitrate of Potash, but usually with Chloride of Sodium and Chloride of Magnesium. It may be readily obtained as a residuum in making several of the preparations of Ammonia, as the Liquor, Spirit, and Carb., or in obtaining C′ by the action of H Cl on Marble.

Prop. Chloride of Calcium L. (Ca Cl=56) is known in two forms. The first is the Anhydrous Chloride, which is hard, greyish-coloured, and semi-translucent. Being without water, it contains nearly twice as much Chlor. Calcium as the crystallized salt. It may be fused at a red heat, and becomes phosphorescent. It is very deliquescent, as is also the crystallized salt, passing readily into the liquid state, forming what used to be called *Oleum Calcis.* It is frequently employed to absorb moisture from gases, also to attract moisture to substances, with which it may be mixed, as the soil. It is very soluble in rectified Spirit, also in water. When in solution its reactions are the same as if it were a Hydrochlorate of Lime, which indeed it may be.

The second, or crystallized variety, contains 6 Eq. of Aq. (Ca Cl+6 Aq.=110). It is colourless and without smell, of an acrid and bitter taste; in striated hexagonal prisms terminated by very acute points. Water even at 32° dissolves more than its own weight, and at 60° above three or four times its weight of this salt. When

heated, these crystals undergo watery fusion. Dissolved in water, they produce great cold ; and hence are frequently employed as an ingredient in cold or freezing mixtures. The Chloride is used for concentrating Alcohol, which it does by its great affinity for water.

This salt is in the Mat. Med. of the L. P. The modes of preparing it are simple.

Prep. E. White Marble is dissolved in commercial H Cl. The solution, when neutral, is concentrated and allowed to crystallize ; more crystals are again obtained by evaporation, and the whole preserved in well-closed bottles.

D. Chalk is here employed instead of Marble ; the solution (slightly acid) is evaporated to dryness ; the salt fused at a red heat, powdered when cold, and kept from the air. The *anhydrous* Chloride is obtained in this way, and is also intended by the L. C. By the E. process the *crystallized* kind is obtained.

The Carb. Lime (Oxide of Calcium) is decomposed, the C′ being expelled in the state of gas; the Chlorine of the H Cl combines with the Calcium, and forms Chloride of Calcium; and the Hydrogen of the acid with the Oxygen of the Lime forms water. In the subsequent part of the D. process both the water used and that formed are expelled during the fusion.

Tests. The presence of Calcium and of Chlorine will be revealed by their respective tests. Chloride of Calcium, L. P. should be free from colour, slightly translucent, hard and friable, totally soluble in water : the solution gives no precipitate on the addition of Ammonia (showing the absence of Magnesia), or Chlor. Barium (of Sulphates), nor, when diluted with much water, with Ferrocyanide of Potassium (showing that it is not contaminated with Iron). E. P. "The crystallized salt is very deliquescent. A solution of 76 grs. in f℥j. Aq. precipitated by 49 grs. Oxal. Ammonia, remains precipitable by more of the test. If it contain any alkaline salt, impurity will be indicated by this method."

Liquor Calcii Chloridi, D. Solutio Calcis Muriatis, E.

Prep. E. Dissolve *Muriate Lime* ℥viij. in *Water* ℥xij.
D. *Chloride Calcium* ℥iij. in *Water* ℥xij.

Action. Uses. Stimulant of the Lymphatics. Used for preparing Muriate of Morphia, (E.), and as a test for Oxalic Acid.

D. ♏xx.—f℥j.

Inc. Decomposed by S′ and by Sulphates, and by N′; by the alkalis and their Carbonates, with the exception of pure Ammonia, which produces no change, and may therefore be prescribed with it.

CALCIS PHOSPHAS PRÆCIPITATUM, D.

Precipitated Phosphate of Lime. Triphosphate of Lime. Bone Phosphate of Lime. *F.* Phosphate de Chaux. *G.* Phosphorsaurer Kalk. Knochenerde.

Bone Phosphate of Lime, as its name indicates, constitutes the earthy matter of bones, teeth, and horns. Some animal excretions, as the Tartar of the teeth, the Phosphate of Lime calculus, are formed of it. It exists also in wheat, and almost all plants. It is obtained by burning bones or horns, *v.* Cornu Cervi, and is employed for obtaining Phosphorus and Phosphate of Soda. (q. v. pp. 38 and 109.)

Prop. It is a white powdery substance, insipid, and insoluble in water. At high temperatures it fuses, and is converted into an opaque enamel. Bone ashes are composed of this phosphate with a little Carbonate of Lime. The Carbonate forms about 6 per cent. of the ash of Ox Bones. Bone Phosphate consists of 1 Eq. of the Tribasic Phosphoric′ with 3 Eq. of Lime. It is a Triphosphate, ($3\,CaO, PO_5 = 156$.)

Prep. To get rid of the Carbonate, and other impurities, the D. C. digest the earth of ox bones in dil. H Cl. By this the whole is dissolved, the Carbonate being decomposed with evolution of CO_2, forming Ca Cl. Ammonia is now added to saturation, the precipitate collected, well washed and dried. The Phosphate only is precipitated; the Ca Cl being decomposed by the Ammonia, yields Lime, which is dissolved. The result is very minutely subdivided.

Action. Uses. Operation uncertain. Supposed formerly to be useful in Mollities Ossium. It is a constituent of James's Powder, and of Pulv. Antim. Comp.

D. gr. x.—ʒß.

EARTHY METALS.

MAGNESIUM.

F. Mâgnésium. *G.* Magnium.

Magnesium ($Mg = 12$) is a metal which has been obtained by decomposing Chloride of Magnesium by Potassium. It is of an iron-grey colour, brilliant, hard, and ductile; not acted on by water, nor by air, except at a high temperature, when it becomes oxidized, and forms Magnesia. As a Chloride, it forms a constituent of Sea-water; oxidized and combined with acids, it exists in sea-water and in numerous mineral springs, and as a Hydrate or native Magnesia in a few places. It forms a portion of Serpentine, Soapstone, Mica, Talc, and many other minerals. It exists in most plants, as in the straw of wheat; also in small quantity in the animal system, especially in the urine and in some urinary calculi. The Oxide, or Magnesia,

may be obtained by burning the Carbonate, as Lime is by burning Limestone, or by adding Potash or Soda to a solution of one of its salts.

Magnesia, L. E. D.

Magnesia Usta, L. Calcined Magnesia. *Talc Earth.* *F.* Magnésie. *G.* Talkerde. Bittererde.

The name Magnesia ($Mg\,O = 20$) occurs in Geber, and afterwards in alchymical works, with various meanings. The present substance was called *Magnesia alba*, and introduced as a medicine in the beginning of the 18th century. It was at first supposed to differ little from Carb. Lime. Hoffman first, and then Dr. Black (1756) clearly established the distinction between it and Lime.

Prop. Magnesia is a white and light, very finely divided, powdery substance, devoid of smell, but earthy in taste. Sp. Gr. 2·3. When moistened, it just turns green the syrup of Violets, and browns Turmeric-paper. It is hardly soluble in water, requiring 5142 parts of cold, and 36,000 parts of hot water. (Fyfe.) Water sprinkled on it becomes absorbed to the extent of about 18 per cent. without the evolution of heat. It is slightly soluble in Alcohol. It attracts moisture and Carb′ from the atmosphere, and becomes slowly converted into the Carbonate. It is infusible, except under the oxy-hydrogen flame, and consists per cent. of Magnesium $60 + O\ 40 = 100$.

Acids readily unite with Magnesia, and form salts, of which those which are soluble, and especially the Sulphate, are bitter, readily distinguishing it from other earths. Caustic Potash decomposes these salts, and throws down Magnesia, which retains about $\frac{1}{4}$ of water, forming the Hydrate, of a somewhat gelatinous consistence. The Carbonates of Potash and of Soda produce precipitates of Carb. Magnesia. The Bicarbonates form a soluble Bicarbonate, precipitable by heat. If the Sesquicarbonate of Ammonia be added, and after this a solution of Phosphate of Soda be dropt in, a copious precipitate takes place of triple Phosphate of Magnesia and Ammonia. The direct addition of Phosphate of Ammonia to the solution of any salt of Magnesia will produce the same effect. Magnesia may be distinguished from Lime by Sesquicarbonate of Ammonia, which precipitates Lime, but not Magnesia; also by Oxalate of Ammonia, which does not precipitate Magnesia, but throws down Lime readily. Ammonia in excess throws down Magnesia, but not Lime, from neutral solutions.

Prep. L. Take *Carb. Magnesia* ℔j.; burn it for two hours in a very strong fire. The E. P. directs that the heat be continued, till the powder, when suspended in water, displays no effervescence on the addition of Mur′. Both the E. and D. P. direct that it be preserved in well-closed bottles.

Here, as in the case of Carb. Lime, Carb′ and water are expelled at

a high temperature, to the extent of 50 or 60 per cent., and the Magnesia remains in its pure state, of which the density may be increased according as the heat is augmented.

Tests. Magnesia, being prepared from the Carbonate, is apt to contain some of the impurities of the salts from which it is made, as Lime, Alumina, and Silica, and, when long kept, some of the Carbonate. H Cl dissolves Magnesia (50 grs. sol. in Dil. H Cl f℥j. E.) without effervescence, showing the absence of Carbonate. If Silica be present, it will be left undissolved. Muriate of Ammonia prevents the precipitation of Magnesia. Thus in a solution acidified by H Cl, Magnesia cannot be precipitated by adding Ammonia in excess, but any Alumina will be thrown down (E.). No precipitate is thrown down by Oxalate of Ammonia from a neutral solution in H Cl, showing absence of Lime; and none by Chlor. Barium, showing absence of Sulph. Mag. and of Carb. Soda. Turmeric ought to be only slightly browned.

Inc. Acids, Acidulous and Metallic Salts, and Hydrochlorate of Ammonia.

Action. Uses. Antacid, Laxative. In acidity of the Stomach, when it forms soluble Magnesian Salts.

D. Antacid, gr. x.—xxx.; as a laxative, ℈j.—ʒj.; for infants, gr. ij.—gr. x.

MAGNESIÆ CARBONAS, L. E. D.

Magnesia alba. Magnesiæ Subcarbonas. F. Carbonate de Magnésie. *G.* Kohlensaure Bittererde. Kohlensaure Talkerde.

Carbonate of Magnesia (Mg O, C O_2=42), at first called *Magnesia alba*, and *Comitissæ Palmæ pulvis*, was used as a medicine by the Count de Palma at Rome, whence it was also called *Pulvis albus Romanus.* It was introduced into the list of the Materia Medica by F. Hoffman. It is found in nature in some mineral waters, in some of which, however, it may exist in the form of the Bicarbonate. In an impure state it forms a constituent of Dolomitic, that is, of Magnesian Limestone, and in a comparatively pure state, a hill in the Peninsula of India, consisting of Magnesia 46, Carbonic Acid 51, Insoluble Matter 1·5, Water 0·5, loss 1=100.

Prop. Pure Carbonate of Magnesia is sometimes found in nature in rhombohedral crystals; as usually seen, the officinal Carbonate is of a white colour, light and soft to the touch, without smell, devoid of any other than an earthy taste when properly prepared. It is unalterable in the air, and nearly insoluble in water, but more soluble in cold than in boiling water. Its solubility is much increased if C′ be present, 48 parts of water being said to be then sufficient. In fact, it is then converted into the Bicarbonate of Magnesia: by spontaneous evaporation 1 Eq. of C′ escapes, and the neutral Carbonate is deposited, being insoluble. It is decomposed by acids and by a strong heat, its Carb. being expelled. The officinal preparation is not a simple Carbonate;

but consists, according to the analysis of Phillips and Fownes, of 1 Eq. of Bihydrate of Magnesia with 4 Eq. of the hydrated Carbonate.

$$Mg\,O,\ 2\,H\,O+4(Mg\,O,\ C\,O_2,\ H\,O).$$

Prep. L. Dissolve *Sulph. Magnesia* ℔iv., *Carb. Soda* ℔iv. ℥ix., each separately in boiling *Aq. dest.* Cij. and strain. Then mix the solutions, and boil for two hours, constantly stirring with a spatula; dist. water being frequently added that it may fill the same measure; lastly, the solution being poured off, wash the precipitated powder with boiling dist. water, and dry it.

E. D. Quantities similar: the solutions are first mixed in the cold, and then boiled.

Here the Sulphate of Magnesia and the Carbonate of Soda mutually decompose each other; the Sul′ uniting with the Soda, forms a Sulphate of Soda, which remains in solution, while the Carb′ unites with the Magnesia. The salt formed, being insoluble, is precipitated as a Hydrated Carbonate of Magnesia, but, in consequence of a portion of the Carb′ escaping, it is not strictly neutral. Professor Graham states that Carb. Soda is not so suitable as Carb. Potash for precipitating Magnesia, "as a portion of it is apt to go down in combination with the Magnesian Carbonate; but it may be used, provided the quantity applied be less than is required to decompose the whole Magnesian salt in solution." Thus an excess of Sulphate Magnesia is ordered by the E. C. The ebullition is necessary to promote the complete separation of the Carbonate. Some $C\,O_2$ being evolved, (*vide suprà*), forms, with a portion of the Carbonate, a soluble Bicarbonate in the cold. This is decomposed by boiling. Carbonate of Magnesia is sometimes pressed, when in the moist state, into the form of cubes. Considerable differences are observed in the density of Carbonate of Magnesia, according to the mode of preparation.

There are two kinds, the *Heavy Carbonate* and the *Light Carbonate*. According to Dr. Pereira, the formation of the heavy kind is promoted by mixing concentrated solutions, at a high temperature, and with the Carb. Soda in excess; that of the light Carbonate by using dilute solutions, in the cold, with an excess of Sulph. Magnesia. The precipitation of the latter takes place more slowly; for which reason it is seen under the microscope to be in great part composed of minute prismatic crystals; whereas the heavy Carbonate presents the appearance of a number of roundish grains, the largest of which are highly refracting (*p.*). By the formulæ above, the light Carbonate would be generally produced.

Tests. The Carbonate, like pure Magnesia, may contain alkaline Carbonates, or Sulphate of Soda, sometimes Gypsum, Lime, and Alumina. "The water in which it is boiled should not alter the colour of Turmeric," showing the absence of any alkaline Carbonate. Chloride of Barium or Nitrate of Silver, added to the water, does not precipitate anything, the first indicating the absence both of Sulphates and of Carbonates of Soda, and the second, if no precip. insoluble in N′,

of any Chloride. When the Carbonate is dissolved in an excess of Muriatic acid, an excess of Ammonia occasions only a scanty precipitate of Alumina, and the filtered fluid is not precipitated by Oxalate of Ammonia, or Bicarbonate of Potash, showing the absence of any Calcareous salt, and of Alumina. 100 parts dissolved in dilute Sul′ lose 36·6 parts in weight of Carb′.

Inc. Acids and Acidulous and Metallic Salts, Hydrochlorate of Ammonia, and Lime-water.

Action. Uses. Antacid, Laxative. Very similar to Magnesia, but differs in Carb′ gas being extricated when it meets with acids in the stomach. Sometimes given in effervescence. Apt to form Concretions if taken for a time.

D. gr. v.—℈j. as an Antacid; gr. xv.—ʒj. as a Laxative, with water, milk, &c.; 14 grs.=℈j. Citrid acid in effervescence.

Pharm. Prep. Hydrargyrum cum Magnesia. Pulv. Rhei Comp. Mist. Camphoræ cum Magnesia.

MAGNESIÆ CARBONAS PONDEROSUM, D. Heavy Carbonate of Magnesia.

This is prepared by the employment of saturated solutions.

TROCHISCI MAGNESIÆ, E. Magnesia Lozenges.

Prep. Mix together *Carbonate of Magnesia* ℥vj., *Pure Sugar* ℥iij., *Nutmeg* ℈j., in powder, with *Tragacanth* mucilage to a mass fit for lozenges.

MAGNESIÆ BICARBONAS.

Aquæ Magnesiæ Bicarbonatis. Aerated Magnesia Water. Soluble Magnesia. F. Bicarbonate de Magnésie. *G.* Zweifach Kohlensaure Bittererde.

This ($Mg\,O,\ 2\,C\,O_2{=}64$) is found in some mineral springs in France, &c. Carbonate of Magnesia becomes soluble when a current of Carbonic acid gas is passed into a mixture of Carbonate of Magnesia and water. A preparation made in Paris in 1821 contained 6 times as much as an English preparation, which contained 36 grains in each bottle. A. Mayler mentions that Mr. Lawrence had been able to dissolve as much as 15 grains of neutral Carbonate of Magnesia in an ounce of water. The French apothecaries prepare an *Eau Magnésienne gazeuse*, which contains ʒj. of Magnesia in a bottle of 22 ounces: a Bicarb. Magnesia is, in fact, formed, with a large excess of Carb′. The second kind, called *Eau Magnésienne saturée*, is not effervescing, and contains ½ an ounce of Magnesia in water Oj., or about 9 grs. in ℥j.

Dr. Christison says that a bottle which holds about ℥viij. may contain 72 grs. of Carb., and ought to hold at least a ℈ in solution. The solution prepared by Mr. Dinneford is said to contain from 17 to

19 grs. in each f℥. That examined by Dr. C. yielded what was equivalent to 8·96 of commercial Carb. in a f℥. The fluid Magnesia of Sir J. Murray, analysed by Profs. Daniell, Kane, and Davy, yielded, in each f℥, 13 grs. of pure Carb. Magnesia.

A substitute, as suggested by Dr. P., may be prepared by pouring the ordinary Soda-water, that is Carbonic acid water, over the common Carb. Magnesia contained in a tumbler; or a mixture of crystallized Sulph. Magnesia and crystallized Carb. Soda, in powder, and in atomic proportions (viz., 123 parts of the former to 144 parts of the latter salt) may be substituted for the Carbonate of Magnesia. By dissolving these quantities together in water, Bicarb. Magnesia and Sulphate Soda are formed by a mutual decomposition. This is something similar to the double Carbonate of Magnesia and Soda, sometimes sold as *Soluble Magnesia.*

Action. Uses. Much the same as Carb. Magnesia, but a more agreeable form for exhibition in Dyspepsia and Lithic acid Diathesis.

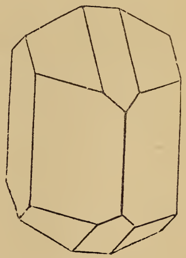
D. f℥iij.—f℥viij.

Magnesiæ Sulphas, L. E. D.

Sulphate of Magnesia. Epsom Salts. *Vitriolated Magnesia. F.* Sulphate de Magnésie. *G.* Schwefelsaure Bittererde.

This salt was first discovered in 1675 by Dr. Grew, in a spring at Epsom. It is found in many countries effloresced on the soil, and on rocks which contain a Sulphate or Sulphuret. It is called *hair salt* and *bitter salt.* It exists in many mineral springs, and in sea-water in the proportion of 15·5 grains in a pint. Its true nature was fully explained by Dr. Black in 1755.

Fig. 21.



Prop. Sulphate of Magnesia ($MgO, SO_3+7\,Aq.=123$) is commonly prepared in acicular crystals, but it may be crystallized in quadrangular or hexangular prisms acuminated by two to six planes, the primary form being a right prism with a rhombic base. The salt is colourless, transparent, and sparkling, of a saline nauseously bitter taste. Unalterable or slightly efflorescent, according to the dryness of the air. Sometimes, but only when impure, deliquescent. Insoluble in Alcohol, soluble in its own weight of water at 60°, and in less than $\frac{3}{4}$ at 212°. Exposed to heat, the crystals melt in their water of crystallization, of which 6 Eq. are at length dissipated; the salt is then fused into an enamel without decomposition. If moistened when in the anhydrous state, water is re-absorbed with increase of tempera-

ture. Sulph. Magnesia is decomposed by Potash, Soda, and their Carbonates, the bases producing a precipitate of Magnesia and their Carbs. one of the Carb. Magnesia. The Bicarbs. Potash, and Soda and the Sesquicarb. Ammonia do not produce precipitates, because the Bicarb. Magnesia, which is produced, is soluble, and no precipitate takes place, unless a portion of C′ is expelled by heat. Lime, Baryta, and their soluble salts decompose it, producing a precipitate of Sulph. Lime or of Baryta. Ammonia decomposes it readily if aided by heat, otherwise partially, forming a triple Sulphate. If Sesquicarb. Ammonia be added to its solution, and then Phosph. Soda, a precipitate is obtained of Ammoniaco-Magnesian Phosphate. Comp. Mg O 16·3, S′ 32·5, Aq. 51·2=100.

Prep. The *bittern* of sea-water, which is left after the crystallization of Common Salt, contains Sulph. Magnesia and Chlor. Magnesium. By simple evaporation the Sulph. Magnesia may be separated by crystallization. Sometimes Sul′ is added to convert the Chloride into a further quantity of Sulph. Magnesia.

At Lymington, in Hampshire, two kinds are manufactured. The Author has to thank Mr. Dyer, a late pupil at King's College, for specimens. The first, called *single*, obtained by the cooling down of a concentrated solution in wooden troughs, is moist and contains a considerable quantity of Chloride (deliquescent). When redissolved and recrystallized, the second, which is called *double* Epsom Salts, is obtained; this is pure, and permanent in ordinary states of the atmosphere. Sulph. Magnesia is also prepared from Dolomitic Limestone, which consists of Carbonates of Lime and Magnesia mixed together in various proportions. One method is, to heat this Magnesian Limestone, and to decompose it with diluted Sul′. Sulphate of Lime, comparatively insoluble, is formed, as well as Sulph. Magnesia, which, being soluble in water, is easily separated and purified by crystallization. Or the mineral may be calcined, when the Carb′ being expelled, the caustic Lime and Magnesia are first hydrated by being moistened with water, and then the Lime converted into Chloride of Calcium, by adding only sufficient H Cl to effect this object, the Lime taking the H Cl, to the exclusion of the Magnesia. The Chloride being readily soluble in water, is by this means easily separated from the Magnesia, which is converted into the Sulphate by the addition of Sul′ or of Sulphate of Iron. Or the Hydrated Lime and Magnesia may be boiled with Bittern, which contains Chloride of Magnesium. This last is decomposed by the Lime. Chlor. Calcium is formed, and remains in solution, while the Magnesia of the Bittern is separated, and obtained tolerably pure, with the Magnesia of Dolomitic Limestone, and may, as before, be converted into Sulphate of Magnesia. These three processes were patented in 1816, by Dr. Henry of Manchester.

Tests. Apt to contain as impurities Chlor. Magnesium, Sulph. Soda, or a little Iron; but that commonly sold is sufficiently pure for medical purposes. Chlor. Magnesium may be suspected when the salt is

moist. Very readily dissolved by water. Sul′ dropped into the solution does not expel any H Cl, showing there is little if any Chloride present, which will also be shown by the absence of a precipitate with Nitr. Silver. 100 grs. dissolved in water, and mixed with a boiling solution of Carb. Soda, yield 34 grs. of Carb. Magnesia when dried. If this quantity be obtained, the salt is unmixed with Sulph. Soda. The E. P. shows that the full proportion of Magnesia is present by another method. "10 grs. dissolved in f℥j. of water, and treated with a solution of Sesquicarb. Ammonia, are not entirely precipitated by 280 minims of solution of Phosph. Soda." Here a little Magnesia is left in solution if the salt be pure. The solution of Phosph. Soda contains 1 part in 20 of water: "Of it 280 minims are sufficient to throw down 97 per cent. of Magnesia in a pure Sulphate," (*c*). Sulph. Soda used sometimes to be mixed with this salt, when it was dearer, and was made to resemble it by being rapidly crystallized with the assistance of agitation. A minute quantity of Iron is sometimes present, giving to its solution a reddish tint. *v.* Tests for Iron.

Inc. Potash, Soda, and their Carbs., Lime-water, Chlorides of Calcium and of Barium, Acetate of Lead.

Action. Uses. Cathartic, Diuretic. A common constituent of a Black Dose.

D. ʒij.—℥j. or ℥ij. In Enemata, ℥j.—℥ij. in some demulcent mixture.

Pharm. Prep. Pulv. Salinus Comp. p. 90. Enema Cath. D.

Chloride of Magnesium, more commonly called Muriate of Magnesia, is found in a few saline springs, and in the waters of the ocean (about 23 grains in a pint).

Aluminum and Alumina.

The metal Aluminum or Aluminium ($Al = 14$) was discovered by Sir H. Davy, but carefully examined by Wöhler in 1828. It is the base of its only known Oxide, Alumina, which is a Sesquioxide, like that of Iron, ($Al_2\,O_3 = 52$). In its impure state, and combined with Silica, it is abundantly diffused, being the essential constituent of all clays and likewise of many rocks. It exists in the purest form in the Sapphire, &c., less pure in Corundum and Emery, and in many minerals. It may be obtained by treating solution of Alum with an excess of Ammonia, when a copious precipitate of white gelatinous Hydrate of Alumina falls down. It is also precipitated by the alkaline Carbonates.

Alumina is devoid of smell or taste, but adheres to the tongue; is very infusible, has a great affinity for water, attracting it from the atmosphere to the extent of $\frac{1}{3}$ of its own weight. When mixed with water it is distinguished by its plasticity; hence, in its impure state

it has from the earliest times been employed in pottery. It has also a strong affinity for various organic substances, and, among them, for different colouring matters; salts, therefore, which contain it, have been long employed in dyeing and in calico-printing. Alumina in the state of Hydrate is soluble in caustic Potash or Soda, and likewise in dilute acids. It may be distinguished by the formation of octohedral crystals of Alum, on evaporating its solution in Dil. Sul′, to which some Sulphate of Potash has been added.

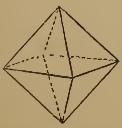
Alumen. Aluminæ et Potassæ Sulphas, L. E. D.

Alum (in crystals). *Argilla Vitriolata. Sulphas Aluminaris. F.* Alun. *G.* Alaun.

The name Alumen of the Romans (Pliny, xxxv. c. 15) and στυπτηρια of the Greeks (Diosc. v. c. 122) was no doubt applied to several salts of the nature of vitriols, and among them to the natural Sulphate of Iron. The Arabs also understood it as a generic term, as they include a variety of salts under the name of *Shib.* Alum, however, was probably not unknown, as Pliny (xxxv. c. 15, § 52) says, "quoniam inficiendis claro colore lanis, candidum liquidumque utilissimum est." The Egyptians and Hindoos have from very early ages been acquainted with the arts of dyeing and of calico-printing. The Hindoos are universally acquainted with the properties of Alum, and employ it for clarifying muddy water, as well as in both the above chemical arts. It may be obtained in every Indian bazaar, and is manufactured in Cutch. The first Alum-works known to Europeans were established at Roccha, formerly called Edessa, in Syria (whence the commercial name of Roch Alum), then near Smyrna, &c., whence the Genoese, &c. supplied Europe. About the middle of the 15th century they were established in Italy, afterwards in Germany, Spain, and at Whitby in England in the reign of Elizabeth. (Aikin, *Dict.* i. p. 43.)

Prop. The Sulphate of Alumina and Potash ($KO, SO_3 + Al_2O_3, 3SO_3 + 24$ Aq. $= 476$), when pure, is without odour, colourless and transparent, of a sweetish, acidulous, and powerfully astringent taste. It reddens Litmus and other vegetable colours, and strikes a green with Syrup of Violets (*p.*). When perfectly crystallized, it is seen in the form of regular octohedrons, but often only as four-sided pyramids, or in large seemingly irregular masses; while what in commerce is called Roch Alum is in small crystalline fragments, with less transparency, and of a reddish hue. Sp. Gr. 1·71. The large masses, when immersed in water for a few days, display on their surfaces octohedral, triangular, and rectangular forms, as may be seen in the specimens in the museum of King's College, originally submitted to experiment by Professor Daniell. Alum is

Fig. 22.



soluble in about 18 parts of water at 60°, but in about $\frac{3}{4}$ its own weight of boiling water. In a dry atmosphere, its crystals are slightly efflorescent; at a moderate temperature (as 92°) it melts in its own water of crystallization, boils up; and if the heat be continued, the water to the extent of 45 per cent. being evaporated, a light white spongy powder, or Burnt Alum, is left. By a stronger heat, the acid is partly expelled and partly decomposed, and the remainder, consisting of Alumina (with some Sulphate of Potash) is insoluble in water. It is also decomposed by the action of carbonaceous matter at a high temperature, forming the Pyrophorus discovered by Homburg and Lemery. Alum is decomposed by the alkalis, the alkaline earths, and by their Carbonates, which combine with its acid and precipitate its Alumina. This is soluble in an excess of the fixed alkalis. Alum is composed of 1 Eq. of Sulphate of Alumina and 1 Eq. of Sulphate of Potash, with 34 Eq. of water; or per cent. Sulph. Alum. 35·73, Sulph. Potash 18·07, Aq. 26·90=100.

One Eq. contains 4 Eq. of $S\,O_3$, 1 in Sulph. Potash, and 3 in Sulph. Alumina ($Al_2\,O_3$, $3\,S\,O_3$). For it is a general rule in Chemistry that the Eq. of acid in a salt correspond in number to those of Oxygen in the base. (Thus the Persulphate of Iron also contains 3 Eq. of Sulphuric Acid.)

The above, which is the common kind of Alum, is sometimes distinguished by the name of *Potash Alum*. There are other kinds, which contain either an Eq. of Sulphate of Soda (instead of Sulph. Potash), hence called *Soda Alum ;* or an Eq. of Sulphate of Ammonia, and then called *Ammonia Alum ;* or the Alumina itself may be displaced, Persulphate of Iron occupying the place of Persulphate of Alumina, and forming *Iron Alum.* Some Alums in commerce contain both Potash and Ammonia.

Prep. Alum is manufactured in large quantities for use in the arts as well as in medicine. This is always in situations where there is some Aluminous rock ; that is, one containing Alumina, and a Sulphuret, usually of Iron (sometimes a salt of Potash). It is exposed to the air, either with or without heat. The Sulphur attracting Oxygen is converted into Sulphuric Acid, which combines with the Alumina and also with the oxidized iron. The Sulphate of Iron is separated, and a salt of Potash is added to the vitriolic solution of Alumina. In Cutch, Carb. of Potash is added to a solution obtained by boiling the blue clay, after it has been exposed for 5 months to the air and watered for 10 or 15 days. By due evaporation, and a repetition of the boiling and evaporation, crystals of Alum are obtained. The chief British manufactories are at Hurlet near Paisley (where simple exposure to air is adopted), and at Whitby in Yorkshire (where aluminous schist is calcined in heaps, and a potash salt added after lixiviation).

Tests. Alum should be colourless, and perfectly soluble in water, showing the absence of any uncombined earthy matter. From the solution, Ammonia or Potash throws down a colourless precipitate of Alumina, which is redissolved when the latter is added in excess. Potash and $S\,O_3$ are known by their respective tests. No precipitate is produced by Ferrocyanide of Potassium, or H S, but Hydrosulph.

Ammonia precipitates Alumina. Heated with Potash, it should evolve no Ammonia. The freedom from colour and the solubility prove the purity of Alum. The presence of Iron may be detected by the addition of Tincture of Galls, which will produce a bluish-black colour after the Iron has been precipitated by Potash.

Inc. Alkalis and their Carbs., Lime and Lime-water, &c., Tartrate of Potash, Phosphates, Acetate of Lead, the Salts of Mercury, Gallic Acid, Inf. of Galls and of Cinchona.

Action. Uses. Astringent, Styptic, both internally and as a Lotion. Collyrium or Injection.

D. gr. x.—℈j.

Alumen exsiccatum, L. E. D. Dried Alum. *Alumen ustum.*

Alum, when thoroughly heated, forms a light, spongy, opaque mass, losing its water of crystallization, but retaining its other properties.

Prep. L. Let Alum ℔j. liquify over the fire; then let the heat be increased, until the ebullition has ceased. (Then reduce to powder E. and D.) The directions of the three Colleges are essentially the same, but care must be taken that the heat is not too powerful, as then a portion of the Sul′ will be driven off.

Action. Uses. Escharotic; occasionally given internally.

D. gr. v.—gr. xv.

Pulvis Aluminis Compositus, E. Compound Alum Powder.

Prep. Mix *Alum* ℥iv. *Kino* ℥j. and reduce them to fine powder.

A useful Astringent in Passive Hæmorrhages and in Chronic Diarrhœas.

D. gr. x.—ʒß.

Liquor Aluminis Compositus, L. Compound Solution of Alum.

This is a powerful astringent lotion, which used to be called Bates' Alum Water.

Prep. Dissolve *Alum* and *Sulphate of Zinc* āā℥j. in boiling Aq. O iij. strain.

Action. Uses. Astringent, Styptic lotion. Diluted with Rose-water, used as a Collyrium and Injection.

METALS PROPER.

Manganesium. *F.* Manganese. *G.* Mangan.

Manganese (Mn=28), the first of the metals proper to be treated of, is not itself officinal, but one of its Oxides is so on account of its Pharmacopœia use. It is hard, brittle, and of a greyish-white colour, emitting a peculiar odour when handled or in a moist atmosphere. Sp. Gr. 8. When pure, it oxidizes readily in the air, requiring to be kept under Naphtha, and is quickly dissolved by Dil. Sulphuric acid.

It forms numerous combinations with Oxygen, but the Black or Peroxide is alone officinal.

MANGANESII BINOXIDUM, L. D. Oxydum, E. Black Oxide of Manganese. *F.* Oxide noir de Manganese. *G.* Manganhyperoxyd.

Prop. The Binoxide of Manganese ($Mn\,O_2=44$), called also Peroxide, is that found most abundantly in nature. It is variable in appearance, sometimes crystallized in needles, often in compact masses, but most frequently is a dull earthy-looking powder, of a black or blackish-brown colour. It is usually sold in the state of a fine powder. It is devoid of both taste and smell; Sp. Gr. 4·8; insoluble in water; nearly infusible; heated, it gives out Oxygen. Treated with H Cl, Chlorine is evolved, as also when mixed with Chloride of Sodium or Common Salt, and Sul'. A Chloride of Manganese (Mn Cl) is formed, and the second equivalent of Oxygen takes the Hydrogen from another atom of H Cl to form water, setting free Chlorine.

$$Mn\,O_2+2\,H\,Cl=Mn\,Cl+2\,H\,O+Cl.$$

The percentage comp. of the Oxide is, Mn 63·75, O 36·25=100.

Tests. Binoxide of Manganese is seldom pure, usually containing more or less of Oxide of Iron, Carbonates of Lime and of Iron, Sulphate of Baryta and clayey matter. "Muriatic acid, aided by heat, dissolves it almost entirely, disengaging Chlorine; heat disengages Oxygen." (L. E.) It also often contains much of the Sesquioxide. Its purity is judged of by the quantity of Oxygen or Chlorine evolved, or by the joint action of Hydrochloric and Oxalic acids. (*v.* Fownes' *Manual of Chemistry*, p. 271.)

Action. Uses. Officinal for aiding in the evolution of Chlorine from Chloride of Sodium (p. 49), for which it is much employed; also used for colouring in glass-making and pottery; seldom in medicine. It is useful in Chemistry as a source of Oxygen.

FERRUM.

Iron. Mars of the Alchymists. *F.* Fer. *G.* Eisen.

Iron ($Fe=28$) is found native, when it is supposed to be generally of meteoric origin; extensively in combination with Oxygen or Sulphur; as a Salt of various acids, as Carbonate, Sulphate, &c.; all these being in a more or less pure state, that is, mixed with earths or other metals. It also exists in vegetables, and in the blood of animals. It is extracted from Iron ores. Some of the Oxides, as Magnetic and Specular Iron ore, are heated only with Charcoal, as in Sweden, Elba, and India, when the Carbon combining with the Oxygen, the Iron is set free, and melted. The Carbonate, Iron Pyrites, Clay Iron ore,

Red and Brown Hæmatites, and Spathose Iron, are first roasted, and then exposed to a fierce heat in contact with Charcoal, Coke, or small Coal, and a flux, either Lime or Clay, according as the ore is argillaceous or calcareous. The Carbonic acid, or Sulphur (in pyrites), is burnt away—the Oxygen (Clay ore and Hæmatites) dissipated as $C\,O_2$. The earthy matters become vitrified, and form a slag at the surface, while the heavy particles of Iron, falling down, run out by a hole at the bottom into moulds, and form *Pig* or *Cast Iron*. This is still impure, from the presence of Charcoal, Sulphur, and portions of Silicon and Aluminum. It is again twice fused in the refining and puddling furnaces, and exposed to the influence of a current of air, at a high temperature, when the whole of the Charcoal and Sulphur are burnt out, and the other impurities form a slag. The metal is taken out, beaten or pressed, and then drawn into bars, which form the *Malleable* or *Wrought Iron* of commerce.

Ferrum in Fila tractum, L. E. D. Iron Wire. Ferri Limatura, E. D. Iron Filings. *F.* Fil de Fer, Limailles de Fer. *G.* Eisendraht, Eisenfeilicht.

Iron wire and filings are ordered, because the former must be made from the most malleable, which is also the purest, Iron; while filings being finely divided, are useful for exhibition, and may be prepared from pure wire, or by means of the magnet be separated from the impurities with which they are apt to become intermixed in the process of filing.

Prop. Iron is well known for its hardness and toughness, and consequent application to an immense variety of useful purposes. It is of a whitish-grey colour; is hard, but malleable, and, though more ductile than many, exceeds all the metals in tenacity. It may be highly polished, and takes a sharp edge. Sp. Gr. 7·8. It is remarkable for its power of attracting and being attracted by the Magnet, as well as for itself and some of its compounds becoming magnetic. When heated, it becomes soft, at a white heat two pieces may be inseparably joined together, or *welded*. It melts at a bright white heat or 1587° of Daniell's pyrometer, but is not volatile. If exposed to the air when heated, or when moist, it absorbs Oxygen, and its surface becomes covered with a coat of Oxide. It burns in Oxygen gas with vivid scintillations. It combines either with 1 Eq. O, forming the Protoxide, or with $1\frac{1}{2}$ (two to three), forming the Sesquioxide, often called the Peroxide. It slowly takes the Oxygen of water, Hydrogen gas escaping. When dilute Sul′ is poured upon Iron-filings, the Iron dissolves as a Protoxide, combining with the acid (taking the O from water, and setting free its Hydrogen), and may be precipitated on the addition of an Alkali, in combination with some water, forming a Hydrated Protoxide of a greenish-white colour. This, when exposed to the air, absorbs more Oxygen, and is converted into the red-coloured Sesquioxide, as may be seen in several of the

officinal preparations. The Protoxide may be readily converted into the Peroxide by boiling any salt containing it with a little Nitric′. The presence of the Iron may then be readily detected by testing the solution with Ferrocyanide of Potassium, or Tincture or Infusion of Galls: the former will form a blue and the latter a black precipitate.

Action. Uses. Iron, in a pure state or in filings, is inert; but, being oxidized in the stomach, may act as a tonic.

D. gr. v.—gr. xx. in Electuary with Honey or Treacle; or in Pills with some of the Bitter Extracts.

Ferri Pulvis, D. Powder of Iron.

This has the advantage of being in a state of very minute subdivision. Hydrogen Gas is passed over Peroxide of Iron, contained in a gun-barrel, and exposed to a red heat. H uniting with O to form water, the Iron is reduced to the metallic state.

Protoxide of Iron.

Oxide of Iron ($Fe\,O = 36$) is obtained when Iron is burnt in Oxygen gas. It is also obtained when Caustic Potash or Soda is added to a solution of the Sulphate of the Oxide of Iron. The white precipitate which falls becomes grey, and then of a bluish-green colour; but this is, in fact, a *Hydrated Protoxide of Iron.* It absorbs Oxygen from the atmosphere, and becomes red, being converted into the Sesquioxide. The Protoxide is a constituent of some officinal salts, as of the Sulph. Iron, and these are usually of a greenish colour, have a metallic taste, and are considered by some to be more efficacious as medicines than those containing the Sesquioxide.

Ferri Sesquioxidum, L. Ferri Peroxidum, D. Ferri Oxydum Rubrum, E.

Sesquioxide or Peroxide of Iron. *Crocus Martis. Colcothar. Chalybis Rubigo præparata. Ferri Subcarbonas. F.* Peroxide de Fer. *G.* Rothes Eisenoxyd.

The Red Oxide of Iron has been variously named, according to the mode of its preparation, though the product is essentially the same. It is abundantly found in nature; as a constituent of many red soils; crystallized in the form of rhomboids and octohedrons in Specular Iron or Iron Glance, as in Elba, in many parts of Europe, and in the Peninsula of India (Porto-Nuovo Works); in a compact state, with impurities, in Red Hæmatite or Red Iron ore. These give a reddish-brown streak on paper, and with Borax form a green or yellow glass; are considerably magnetic, but do not, like magnetic Iron, attract Iron-filings.

Prop. The Sesquioxide ($Fe_2 O_3=80$) or Peroxide of Iron, artificially prepared, is a powder of a reddish-brown colour, without smell, but has a chalybeate taste, except when prepared by calcination; is insoluble in water, and does not attract the magnet, unless it contain, as is sometimes the case, some of the Black Oxide. Sp. Gr. 3. It ought to dissolve in H Cl without effervescence; but it usually contains a little Carb′ (2 to 5, sometimes even 15, per cent., according to Mr. Phillips). It was therefore formerly called Carbonate and Subcarbonate of Iron, which usually was, what it is now called, merely Sesquioxide of Iron. The Hydrochloric solution forms a black precipitate with Tinct. or Inf. of Galls, and a blue precipitate with Ferrocyanide of Potassium. Fe $70+O$ $30=100$.

Different processes have at different times been adopted for making this preparation; all are effectual, in consequence of the facility with which Iron, when once oxidized, absorbs a further proportion of Oxygen. Formerly the Sulphate of Iron was calcined, when it lost first its water of crystallization, and then its acid: some of this, however, yielded a portion of its Oxygen to form the reddish-coloured Sesquioxide. Or a solution of the Sulph. of Iron is decomposed by the addition of a sol. of Carb. of Potash or of Soda, when a Carb. of Oxide of Iron is precipitated. This being dried in the air, the Carb′ soon escapes almost entirely, and the Protoxide absorbs the due quantity of Oxygen from the atmosphere, and from a white, and then green powder, is converted into the reddish-coloured Sesquioxide.

Prep. L. Take boiling *Aq.* Cvj. Dissolve *Sulph. Iron* ℔iv. in boiling *Aq.* Ciij, then dissolve *Carb. Soda* ℔iv. ℥ij. in boiling *Aq.* Ciij. Mix the solutions; and let the precipitate subside. Wash the precipitate well with water, and dry it. E. Similar. The D. formula is more exact, the Peroxide being prepared free from Carbonate by heating in a crucible the Ferri Peroxidum Hydratum, q. v.

Tests. This preparation may be carelessly prepared, but is not likely to be adulterated. "Dissolved totally by dilute H Cl (aided by gentle heat, E.) with very slight effervescence, and this is precipitated by Potassa." L. P. Earthy impurities will remain undissolved; if the presence of metals is suspected, they can be detected by their tests.

Inc. Acids and Acidulous Salts.

Action. Uses. Tonic.

D. gr. v.—ʒß. In Neuralgia, ʒß.—ʒij. or even ʒiv. two or three times a day.

For external application, there are two plasters containing this Sesquioxide, which, from the support such applications are calculated to afford, and from the moderately stimulant nature of the ingredients, are in general esteemed as strengthening plasters.

EMPLASTRUM FERRI, L. E. D. Emplastrum Roborans. Iron or Strengthening Plaster.

Prep. L. Melt together *Plaster of Lead* ℥viij., and *prepared Frankincense* ℥ij. over a slow fire. Sprinkle into them *Sesquioxide of Iron* ℥j. and mix.
E. D. Similar: the E. P. ordering, instead of *Thus*, Resin, Wax, and Oil. The D. P. Burgundy Pitch.

Uses. The efficacy of the Oxide of Iron is doubtful. It gives mechanical support to relaxed muscles, and affords warmth and protection to the chests of delicate persons.

FERRUGO, E. Ferri Peroxidum Hydratum, D. Hydrated Sesquioxide of Iron.

This is a hydrate of the above, ($Fe_2 O_3 + 3 HO = 104$), which is thus more ready to enter into combination than the Anhydrous Oxide. It was first introduced by the E. C. as an antidote in cases of poisoning by Arsenious acid.

Prop. It is of a yellowish-brown colour, and though it can be dried without decomposition, it requires to be kept in a moist state, as in this state it combines so readily with Arsenious acid, that when prepared according to the following formula, and added in the proportion of 12 parts to 1 of Arsenious acid, and well shaken, the filtered liquor which previously contained the Arsenic, afterwards displays no traces of its presence, an insoluble Arseniate of the Protoxide of Iron having been formed. (Graham.)

Prep. E. Dissolve *Sulph. Iron* ℥iv. in *Aq.* Oij.; add commercial *Sul′* f℥iijß. and boil; then add *Nitric′* (D. 1·380) f℥ix. in small portions, boiling for a few minutes after each addition, until the liquid acquires a yellowish brown colour, and gives with Ammonia a precipitate of the same colour. Filter, allow the liquor to cool, and add *stronger Aqua Ammoniæ* f℥iijß. proceeding as directed in the process for Ferri Oxydum Nigrum, E. When kept as an antidote against poisoning by Arsenic it is preferable merely to squeeze it and preserve it in the moist state, in stoppered bottles.

In this formula the Protoxide is converted into the Sesquioxide by taking some of the Oxygen of the Nit′. The Sul′ is added to preserve the Sesquioxide formed in a state of solution, as Sulph. of the Sesquioxide. The Persulphate contains a larger proportion of Sul′ than the Protosulphate. So that 2 Eq. of the latter are converted into one of the former salt by the addition of 1 Eq. of O and 1 of SO_3.

$$2 (Fe O, S O_3) + O + S O_3 = Fe_2 O_3, 3 S O_3.$$

When Ammonia is added to this in excess, it combines with the Sul′, and Sulph. Ammonia formed remains in solution, while the Sesquioxide is precipitated in combination with water, forming a Hydrated Sesquioxide of Iron.

The yellow-coloured rust which forms when Iron is fully exposed to water and to the air, is very much the same in composition as the above, though it is not to be substituted for it as an antidote.

D. The mode of preparation is essentially the same, except in the fact of Caustic Potash being used instead of Ammonia to precipitate the Oxide. This is decidedly a change for the worse. If *not* in excess, the Potash precipitates a Subsulphate of Iron; but if in excess, the Oxide is thrown down with a considerable quantity of the Potash in combination with it. It is then found not to act so well as an antidote. The E. preparation contains a little Ammonia, which, however, does not invalidate its utility.

Tests. Entirely and easily soluble in Mur′ without effervescence: if previously dried at 180°, a stronger heat drives off about 18 per cent. of water. The magnet does not attract it. E.

Action. Uses. A good substitute for the dry Sesquioxide, and the best antidote to Arsenious acid.

D. gr. x.—ʒß. as a Tonic; in much larger doses as an antidote.

Ferri Oxydum Nigrum, E. Ferri Oxydum Magneticum, D.

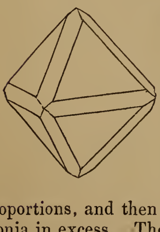
Black Oxide of Iron. Magnetic Oxide. (Fig. 23.) *Æthiops Martialis.* A compound of Protoxide and Sesquioxide of Iron. *F.* Oxide de Fer noir. *G.* Schwarzes Eisen Oxydul. Eisen Mohr.

Black Oxide ($Fe_3 O_4 = 116$) or Martial Ethiops, long one of the esteemed preparations of Iron, was formerly made by moistening Iron-filings with water, and also by levigating the scales of the Oxide found in a smith's forge. It is probably composed of 1 Eq. Protoxide+1 Eq. Sesquioxide of Iron=116.

Prep. E. Dissolve *Sulph. Iron* ℥iij. in boiling *Aq.* Oiß., and add commercial *Sul′* f℥ij. and f℈ij.; boil, and gradually add pure *Nit′* f℥ivß., boiling briskly for a few minutes after each addition. Again dissolve *Sul. Iron* ℥iij. in boiling *Aq.* Oiß. Mix the two solutions and immediately add of *stronger Aqua Ammoniæ* f℥ivß. in a full stream, stirring the mixture briskly. Collect the black powder in a calico filter and wash it with water, till Nitr. Baryta causes scarcely any precipitate; dry it at a temperature not exceeding 180°.

D. Similar, except that Caustic Potash is used instead of Ammonia.

Fig. 23.



In the above formula, proposed by Wöhler, the first portion of the Sulph. of the Oxide is converted into the Sulph. of the Sesquioxide Iron, by the addition of the Nit′, which yields a portion of its Oxygen, while Nitric Oxide gas escapes. As the object, according to Dr. Christison, is to obtain a compound, one half of the Iron of which is in the state of Protoxide, and the other in that of Sesquioxide, this is effected by mixing together the Sulphates of the Protoxide and Sesquioxide in the requisite proportions, and then precipitating them both by the addition of Ammonia in excess. The Oxides unite at once in the act of separation, and fall down in the form of a dark greyish-black powder, which,

under exposure to the air, either with or without moisture, shows no tendency to undergo further oxidation.

Tests. Dark greyish-black; strongly attracted by the magnet; heat expels water from it; Mur′ dissolves it entirely; and Ammonia precipitates a black powder from this solution, E. P. Wöhler considers the above Oxide to be composed of 2 Eq. of Protoxide and 1 of Sesquioxide of Iron, with two of water.

Action. Uses. Tonic.

D. gr. v.—℈j. two or three times a day.

Ferri Iodidum, E. D.

Iodide of Iron. *Ioduret and Hydriodate of Iron.* *F.* Iodure de Fer. *G.* Eisen Iodür.

Introduced into practice by Dr. A. T. Thomson, and described in his *Obs. on the Prep. and Med. Employment of the Iodurets and Hydriodate of Iron.*

Prop. Iodide of Iron ($Fe\ I + 5\ Aq. = 199$) is of a dark-grey colour, with somewhat of a metallic appearance; its taste is acrid and styptic. It is often prepared in thin cakes, of a crystalline radiated structure, and light grey colour when fractured. If its solution be evaporated with as little contact of air as possible, green tabular crystals are formed. It is very deliquescent, and readily dissolved in water, as also in Alcohol. The solution is green, and when diluted, is not disagreeable in taste. Heated, it readily fuses, and volatilizes; but is then easily decomposed, Iodine escaping in vapour, and Iron being left behind, in a more or less oxidized state. From the absorption of Oxygen, the same change takes place on exposure to the air: water is then absorbed to the extent of forming a dark-coloured solution, in which some Iodide of Iron with a little free Iodine is held in solution, and a Sesquioxide of Iron precipitated. It is difficult to preserve it in solution, unless a coil of Iron wire, as suggested by Mr. Squire, be introduced into it. In this case, any Iodine set free combines with the Iron, forming the Iodide again, but though the solution remains pure, some Sesquioxide of Iron is still precipitated. Sugar also has been ascertained to have this preservative effect.

Comp. $Fe\ 14 + I\ 63{\cdot}3 + Aq.\ 22{\cdot}7 = 100$.

Prep. The L. C. prepare it only in the form of syrup, as it is best preserved in that state.

E. Take of dry *Iodine* gr. 200, and of fine *Iron Wire* recently cleaned, gr. 100, *Dist. Water* f℥vj. Boil together in a glass matrass, first gently, to avoid the expulsion of Iodine vapour, afterwards briskly till concentrated to 1-6th of its volume. Put the filtered liquid quickly into an evaporator, with 12 times its weight of Quicklime round the basin, in an apparatus where it may be shut up in a small space, out of contact with the general atmosphere. Heat the whole apparatus, till all the water be evaporated. Preserve the product in small well-closed vessels.

D. Similar: proportions the same; but without so many precautions being adopted.

The Messrs. T. and H. Smith make a solution of Iodide of Iron in a Florence flask with ʒvj. of pure iron filings, ℥ij. ʒij. of Iodine and f℥ivß. of cold distilled water. Boil till the liquid loses its colour, and filter rapidly into another clean flask, and evaporate at a boiling heat. They obtain the compound either as a crystallized hydrate, or in an amorphous anhydrous form, according to the extent of the evaporation, and enclose without the smallest delay in small well-corked bottles. Mr. Kop recommends triturating 4 parts of Iodine with 2 parts of water, in a large dish; then to add at once, 1 part of iron filings in a state of fine division, and to continue the trituration.

Of the Pharmacopœia preparations that of the E. P. is preferable. The solution, like that of all the protosalts of Iron, is of a green colour. If this be quickly filtered and evaporated, and with as little access of air as possible, the salt may be obtained without much decomposition; but, as the Iron is apt to pass rapidly to the state of Sesquioxide, it is best prepared according to the Messrs. Smith's improved formula. As all the solid preparations are liable to change, they further recommend to powder their anhydrous Iodide as soon as it is taken from the flask, and then instantly to incorporate it with twice its weight of pure refined Sugar in powder, and to make it into a mass with honey. 4 grains will contain 1 grain of the Iodide. Keep in shallow, corked bottles in a layer of some powder. (P. J. iii. 490.)

Tests. Entirely soluble in water, or nearly so, forming a pale-green solution, E. It gives off violet vapours when heated, leaving Sesquioxide of Iron; entirely soluble when recently made; but this solution in an ill-closed vessel quickly deposits Sesquioxide of Iron, and can be kept clear only in a vessel well closed and containing a coil of Iron wire. It answers to the common tests for Iodine, and for the Protoxide of Iron.

Inc. Acids, Alkalis, and their Carbonates, Lime-water and all such substances as are imcompatible with Sulphate of Iron, such as vegetable astringents.

Action. Uses. Tonic, Deobstruent, Emmenagogue.

D. gr. j.—gr. v. or gr. x. in solution in water (a solution of gr. iij. in fʒj. is a convenient strength), in syrup, or in the saccharine pills. Or it may be conveniently dissolved in Cod-liver Oil, (4 grs. in the oz.), for scrofulous patients.

Syrupus Ferri Iodidi, L. E. D. Syrup of Iodide of Iron.

Prep. L. Mix *Iodine* ℥j. and *Iron wire* ʒiij. with *Water* ℥vij., and heat until the solution assumes a greenish colour. Strain. Evaporate to about f℥iv, and add *Sugar* ℥x. When the syrup has cooled, add water enough to fill up the measure of ʒxv., and keep it in a well-stoppered black glass vessel.

E. Similar. Iodine and Iron in the proportions used in making Ferri Iodidum. Dry Iodine is ordered. D. Similar.

All three preparations are about the same strength; viz. 5 gr. Iodide of Iron to a fluid drachm.

Sugar prevents the Protoxide of Iron from passing to the state of

Peroxide, as in the Ferri Carbonas Saccharatum, and thus has been found to preserve the Iodide of Iron. A syrup was first suggested in Buchner's Repertor. für die Pharmacie for 1839. The E. C. first introduced a formula of the Messrs. Smith modified from one proposed by Dr. A. T. Thomson, in the Trans. of the Pharm. Society, i. 47. This solution undergoes little change, even when preserved for some time. It ought to be "nearly colourless, or pale yellowish green, and without sediment." Dr. C. cautions against employing common British Iodine in the proportions (of the E. P.), unless allowance is made for the moisture of the Iodine. The Syrup ought not to be diluted long before it is to be taken, and therefore the patient should himself make the mixture.

D. f℥ß.—℥j. a weaker preparation may often be used with advantage.

Bromide of Iron is prepared in precisely the same way as the Iodide, substituting Bromine for Iodine, as in the first part of the process for making Bromide of Potassium. Mr. Squire informs me that a coil of Iron wire traversing the whole column of the solution, is necessary to preserve it in a neutral and uniform state, and is perfect in its action. Others prefer the Syrup to the aqueous solution. The Bromide of Iron acts as an energetic Tonic.

Tinctura Ferri Sesquichloridi, L. D. Ferri Muriatis Tinctura, E.

Tincture of the Sesquichloride or Muriate of Iron. Steel Drops. *Tinctura Ferri Muriati. Tinctura Martis cum Spiritu Salis. F.* Teinture de Perchlorure de Fer. *G.* Saulzsaure Eisentinctur.

Prop. The Sesquichloride of Iron ($Fe_2 Cl_3 = 164$) is one of the more powerful of the ferruginous preparations. Iron combines with Chlorine both as a Protochloride and a Sesquichloride (*Proto-chlorure* and *Per-chlorure de Fer* of the French). The first is white, in small scales, very soluble in water and alcohol, forming a green-coloured solution, and liable to change from the avidity with which the Iron absorbs Oxygen, and is precipitated as Sesquioxide; the Chlorine being left in the proportion to form the Sesquichloride. A Tincture of the Chloride is much used on the Continent. Both Chlorides used to be contained in the Tincture of the British Pharm. when it was made with the Black Oxide of Iron. A little of the Chloride exists in the present preparation. The Perchloride or Sesquichloride is volatile at a red heat. When the solution is concentrated, it yields either orange-yellow crystalline needles radiating from a centre, or large dark yellowish-red crystals. When sublimed, it is in brilliant scales, of a lively hue, very soluble in water, Alcohol, and Ether. Comp. Fe 34·15+Cl 65·85=100.

Prep. L. Pour upon *Sesquioxide of Iron* ℥vi., *Hydrochloric′* Oj. in a glass vessel, digest for 3 days, frequently shaking. Add Rectified Spirit Oiij. Filter. E. Similar.

D. Made by dissolving Iron Wire in Aqua Regia, &c. This preparation is about 2½ times stronger than that of the L. and E., having a Sp. Gr. of 1·237.

In this formula, the Oxygen of the Oxide combines with the Hydrogen of the acid, and water is formed, while the freed Chlorine unites with the Iron in the same proportion, and thus Sesquichloride of Iron is formed ; also a little Protochloride, in consequence of the Sesquioxide almost always containing a small portion of the Carbonate of Iron, of which the Carb′ is expelled in effervescence. As the acid is in excess to keep the Chloride dissolved, the solution produces an acid reaction on test-paper, and the taste is acid and astringent. It has a smell of Hydrochloric Ether, in consequence of the acid acting on the Alcohol, and is of a reddish or olive-brown colour. Sp. Gr. 0·992. The Tincture of commerce Mr. Phillips found to vary in strength from $9\frac{8}{10}$ to 20 grains of the Peroxide, but as above prepared a f℥ contains nearly 30 grs. of Sesquioxide of Iron. The presence of the Iron is readily indicated by its tests, p. 139. It is necessary to remember that a black inky mixture will be formed with any astringent vegetable preparation. The Chlorine forms a precipitate of Chloride Silver, when the Nitrate of Silver is added. It is also decomposed by the mucilage of Gum Arabic. The Perchloride is sometimes dissolved in Hoffman's Liquor, and is then called Teinture de Bestucheff, the old Tinctura Nervina Bestucheff.

Tests. The strength and purity of this Tincture must be ascertained by its correspondence with the above characters, and by the quantity of the Sesquioxide precipitated by Liquor Potassæ, = 30 grs.

Inc. Alkalis, Earths, and their Carbonates; Astringent Vegetables.

Action. Uses. Irritant, Caustic, Astringent, Tonic.

D. ♏x.—♏xxx. even ʒj.—ʒij., in some suitable diluent.

Ferri Ammonio-Chloridum, L.

Ammonio-Chloride of Iron. *Ferrum Ammoniatum. Flores Martiales.* *F.* Chlorure Ferroso-Ammoniacal. Muriate de Fer et d'Ammoniaque. *G.* Eisenhaltiges Salzsaures Ammoniak. Eisen salmiak blumen.

This preparation was discovered by Basil Valentine in the 14th century, and has been employed in medicine under various names.

Prop. It is an orange-coloured powder, formed of small crystallized grains, which have a saline and astringent taste, with but little odour. It is deliquescent, very soluble in both water and Alcohol, and is considered to be only a mechanical mixture of Sesquichloride of Iron 15 parts, and Hydrochlorate of Ammonia 85 parts. Its nature is recog-

nized by the effects of Potash or caustic Lime in evolving Ammonia, and the Iron and Chlorine will be revealed by their appropriate tests. Mr. Phillips has ascertained that it yields about 7 per cent. of Sesquioxide of Iron.

Prep. L. Digest *Sesquioxide of Iron* ℥iij. in *Hydrochloric Acid* Oß., in a proper vessel, in a sand-bath for 2 hours; add *Hydrochlorate of Ammonia* ℔ijß. first dissolved in *Aq. dest.* Oiij. Strain and evaporate to dryness. Rub the residue to powder.

In the first part of this process a Sesquichloride of Iron is formed, as in the foregoing Tincture. To this the Hydrochlorate of Ammonia being added, the salts become intimately mixed. But Mitscherlich has described a definite double salt, of 1 Eq. of Sesquichloride of Iron to two of the Hydrochlorate of Ammonia ($Fe_2\ Cl_3, +2(N\ H_3,\ H\ Cl)+2\ Aq.=290$), which may possibly exist in this preparation. It is sometimes made by merely mixing these two together in the requisite proportions, dissolving in water, and then evaporating to dryness. It was formerly prepared by sublimation.

Tests. Totally soluble in proof Spirit and in water. Potash throws down Sesquioxide of Iron from the solution (in consequence of the Potassium combining with the Chlorine, and the Oxygen with the Iron), and if added in excess, disengages Ammonia, by decomposing the Hydrochlorate of Ammonia.

Inc. Alkalis and their Carbs., Lime-water, Astringent Vegetables.

Action. Uses. Tonic, &c.

D. gr. iij.—gr. x. in syrup, or bitter but not astringent extract.

TINCTURA FERRI AMMONIO-CHLORIDI, L. Tincture of Ammonio-chloride of Iron.

Prep. Dissolve *Ammonio-Chloride of Iron* ℥iv. in *Proof Spirit* and *Dist. Water* āā Oß. and filter. (The spirit is thus diluted, in order that the preparation may be entirely dissolved by it.)

This preparation is convenient for internal exhibition. f℥j. contains 5·8 grains of Sesquioxide of Iron; (6·8 grains, according to Mr. Denham Smith). It is $\frac{1}{4}$ or $\frac{1}{5}$ only of the strength of the Tinct. Ferri Sesquichlor.

D. f3j.—f3ij.

FERRI SULPHURETUM, E. D.

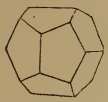
Sulphuret of Iron. Iron Pyrites. *F.* Sulfure de Fer. *G.* Schwefeleisen.

Iron combines with Sulphur in several proportions. It is common in the form of the Bisulphuret, of a yellowish colour. It was no doubt known to the ancients.

Prop. The natural Bisulphuret ($Fe\ S_2=60$) or Iron Pyrites, called also Mundic, is of a colour like Brass, in hard cubical crystals, which

are not acted upon by any of the acids except the Nitric. Sp. Gr. 4·98. Often heated for the separation of the Sulphur by sublimation. If moistened and exposed to the air, Oxygen is absorbed, and the Sulphuret converted by degrees into Protosulphate of Iron.

Fig. 24.



Of the following processes, the first, though inferior, yields a product good enough for pharmaceutic purposes. It dissolves readily in Sul′ and H Cl; H S gas is evolved, and Protosulphate of Iron remains in solution. The composition varies: the Protosulphuret consists of Fe S$=$44, the Sesquisulphuret of Fe_2 $S_3$$=$104, and the Bisulphuret of Fe $S_2$$=$60.

Prep. E. Heat *Sublimed Sulphur* part j. and *Iron-filings* part iij. in a crucible on a common fire till the mass begins to glow. Then remove the crucible and cover it till the action, which increases considerably, ceases; or else, take a *rod of Iron,* heat it white-hot in a forge, rub it with a *roll of Sulphur* over a deep vessel filled with water to receive the fused globules of Sulphuret. D. Same as the second process.

By the first process a Protosulphuret would be formed, if the mixture were in the proportion of 7 parts of Iron-filings to 4 of Sulphur. These rapidly combine; heat is produced even to redness, and Sulphurous vapours escape: the redness will be maintained, even when the crucible is removed from the fire. It usually contains an excess of Iron. The D. and second Ed. process yields a pure product, for which it is essential that the Iron be heated to a full white heat, when, the Iron and Sulphur combining together, bright sparks are emitted, and the melted Sulphuret falls into the water in light brown-coloured globules. Comp. Fe 63·4$+$S 36·6$=$100.

Tests. Nearly soluble in diluted Sul′ with disengagement of Hydrosul′ gas. E.

Action. Uses. Antidote against Corrosive Sublimate. Employed as a ready means of obtaining Hydrosul′ gas by the addition of Sul′ or H Cl.

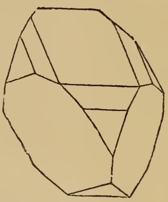
FERRI SULPHAS, L. E. D.

Sulphate of Iron. Sulphate of the Protoxide of Iron. *Ferrum Vitriolatum. Sal Martis. F.* Sulfate de Fer. *G.* Schwefelsaures Eisenoxydul. Eisenvitriol.

Vitriolated Iron, or Green Vitriol, was known to the ancients. It is mentioned in the *Amera Cosha* of the Hindoos (*Hind. Med.* p. 44), and it is used by them, as by the Romans in the time of Pliny, in making Ink. It is found in nature: the Sulphuret, absorbing Oxygen from the atmosphere, is converted into the Sulphate of the Protoxide of Iron; this is apt to be changed again into the red-coloured Sulphate of the Sesquioxide. The Sulphate, being soluble, is found in some mineral waters. It is also made artificially on a large scale

for use in the arts by exposing moistened Pyrites to the air, and is called Copperas or Green Vitriol. (By this slow oxidation an excess of Sul′ is produced. This is saturated either by the Alumina contained in Clay, or by the addition of metallic Iron). The Sulphate of Iron is purified by crystallization.

Fig. 25.



Sulphate of Iron ($FeO\ SO_3+7$ Aq. $=139$) is a transparent crystallized substance of a bluish-green colour, and a styptic (which is also called an inky) taste. The crystals are modifications of the oblique rhombic prism. Sp. Gr. 1·82. They are soluble in a little more than their own weight of cold and in $\frac{3}{4}$ of their weight of boiling water. In the air they effloresce slightly, and the salt, absorbing Oxygen, is converted into the Sesquisulphate of Iron. Heated, it is first melted in its water of crystallization; this is afterwards expelled, and the salt reduced to the state of a dry white powder. (*v.* Ferri Sulphas exsiccatum, E.) At a still greater heat, the acid is expelled, and may be obtained in the form of anhydrous or glacial Sulph′, the latter portion being decomposed. The Iron is left in the state of the reddish-coloured Sesquioxide, the *colcothar* of old authors. Sulph. Iron is insoluble in Alcohol; its solution in water reddens Litmus; its Iron is precipitated on the addition of alkalis, alkaline earths, and their Carbonates, by the former as a Hydrated Protoxide, and by the latter as a Carbonate, which are both soon changed into the red Sesquioxide. q. v. With Ferrocyanide of Potassium, a white precipitate is formed with the pure Sulphate of the Protoxide, but a blue one if the Sesquioxide be present: the same change of colour ensues when the former precipitate is exposed to the air. The Ferrocyanide of Potassium, or *Red Prussiate of Potash*, forms a blue precipitate with solutions of the Proto-salts of Iron. A black precipitate (Gallate of Iron) is formed when the Sulphate containing any of the Sesquioxide is added to an infusion or tincture of Galls, or of any other astringent vegetable. Comp. Fe O 25·9 +S′ 28·8+Aq. 45·3=100.

Prep. Three ways of preparing the pure Sulphate are adopted in the three Pharmacopœias. The L. C. employ the commercial or impure Sulphate (Ferri Sulphas Venalis, L.). *Acid Sulph.* f℥j. is mixed with *Dist. Water* Oiv. To these are added ℔iv. of the *commercial Sulphate* and ℥j. of *Iron Wire.* Heat is applied, and the solution stirred frequently until the Sulphate is dissolved. Strain while hot. Put by, that crystals may form. Evaporate again, and again crystallize. Dry all the crystals. (By this process any excess, either of acid or of iron, in the commercial salt, is neutralized and supplied.)

The E. C. dissolve the impure Sulphate in water, acidulated with Acid Sulph., and crystallize.

The D. C. simply prepare the salt by dissolving pure Iron Wire in dilute Sulphuric Acid, and crystallizing.

The L. process is perhaps the best.

Concentrated Sul′ does not act on pure Iron, but the water of the dil. acid becoming decomposed, yields its O to the Iron, while H escapes in the form of gas. The Oxide of Iron formed unites with the Sul′, and the Sulphate of Iron is thus obtained. (D. C.)

Tests. Pale bluish-green crystals, with little or no efflorescence; entirely soluble in water; this solution does not deposit Copper upon Iron being immersed in it; being first boiled with Nit′, and then precipitated by excess of Ammonia, it yields on filtration a fluid which is colourless or very pale blue. If it be of a deep blue, then Copper is present. (Ammonia precipitates all the Oxide of Iron, but not any Oxide of Copper, if present.) Green Vitriol commonly contains some Persulphate of Iron. Thus the Sesquioxide may generally be detected in its solution by its appropriate tests. But to obtain the perfect reactions of the Sesquioxide, which are more characteristic than those of the Protoxide, the solution should be oxidized by boiling with some Nit. Acid. Zinc may be detected by adding Ammonia in excess to the Sesquioxidated solution; after filtering, expel the excess of Ammonia by heat, and any Zinc which is present will be deposited in flakes of the white Oxide.

Inc. Alkalis and their Carbonates, salts of Calcium and of Barium, Acetate and Diacetate of Lead, Nitrate of Silver, Vegetable Astringents.

Action. Uses. Astringent, Tonic, Emmenagogue.

D. gr. j.—gr. v. in pills with Bitter Extracts or Aromatic Confection.

Mr. Phillips warns from giving it in solution without first boiling the water, and expelling its atmospheric air, of which the Oxygen would peroxidize the Oxide.

Ferri Sulphas exsiccatum, E. Siccatum, D. Dry or Anhydrous Sulphate of Iron.

Prep. Heat moderately in an earthen vessel, not glazed with lead, *Sulphate of Iron* q. s. till converted into a dry greyish white mass; powder this.

Convenient for exhibition in the form of Pills. By heat the crystals readily lose five-sixths of the water of crystallization, and the dried, therefore, is in this proportion stronger than the common Sulphate of Iron.

D. gr. ß.—gr. iv.

The dried Sulphate is employed in the E. P. in making the

Pilulæ Ferri Sulphatis, E.

Prep. Take dried *Sulphate of Iron* 2, *Extract of Taraxacum* 5, *Liquorice-root Powder* 3, and *Conserve of Roses* 5 parts. Beat them into a proper mass and divide into 5 grain pills.

D. gr. x.—gr. xx.

FERRI SULPHAS GRANULATUM, D. Granulated Sulphate of Iron.

This is in very minute crystals. It is obtained by pouring a hot concentrated solution of the pure Sulphate into Rectified Spirit, in which the salt is insoluble. The small crystals which form are separated by filtration, and washed. They are dried first on bibulous paper, and then by exposure under a bell-glass over strong Sulph. Acid.

Pilulæ Aloes et Ferri, E. Contain 1 grain of the Sulphate in about 5 grains, with Aloes and Aromatic powder.

Pilulæ Rhei et Ferri, E. Contain 1 grain in 6 grains, with Extract of Rhubarb.

CARBURET OF IRON.

Plumbago or Graphite.

This, commonly called Black Lead, is usually considered to contain a Carburet of Iron; but, as the purest specimens are composed almost entirely of Charcoal, it is treated of with that substance. The specimens containing any notable proportion of Iron must have some of the properties of Ferruginous preparations. Steel, being composed of pure Iron combined with a very small quantity of Carbon, is a true Carburet of Iron.

FERRI CARBONAS, D.

Carbonate of Iron. *F.* Carbonate de Fer. *G.* Kohlensaures Eisenoxyd.

The name of Carbonate of Iron long held a place in the Pharmacopœia, but the preparation which was so called in the L. P., is now known under the name of *Ferri Sesquioxidum*, which contains about 4 per cent. of the Carbonate. The Carbonate of Iron is, however, officinal in the present L. P. in the form of *Ferri Carb. c. Saccharo*, as well as in the *Mistura Ferri Composita* and in the *Pilulæ Ferri Comp.*, as likewise in the *Ferri Carbonas Saccharatum* and the *Pilulæ Ferri Carbonatis*. (E. P.)

Carbonate of Iron ($FeO, CO_2 = 58$) is obtained by precipitating with an alkaline Carbonate a solution of any proto-salt of Iron, *e.g.* the Sulphate. A soluble Sulphate of Potash or of Soda is obtained in solution, and an insoluble Carbonate of Iron is precipitated. This is at first of a greenish-white colour, but becomes of a brownish-red colour in the air, and is converted into the Sesquioxide. (*v.* supra.) On the supposition that the protosalts are more efficient as medicines than the persalts, it has been the practice with many to direct the *Mistura Ferri Composita* to be taken as much as possible when fresh made, or when of a greenish colour. Sugar has long been prescribed with Ferruginous preparations, as in the old *Mars Saccharatus*, and

still with the Carbonate of Iron, the Mist. Ferri Comp. and Pil. Ferri Comp. Soubeiran states that the idea of preventing the oxidation of the Carbonate of Iron, and preserving a uniform medicine, first occurred to Dr. Becker, and that it was put into practice by M. Klauer, a Pharmacien of Mulhausen, who employed Sugar for this purpose, having discovered that it had the power of preventing the Protoxide of Iron from passing into the state of Peroxide by absorbing more Oxygen. Experiments have also been made by Drs. Clark and Christison, and Sugar is employed in preserving the Iodide, Bromide, and Chloride of Iron, as well as Iron-filings.

Prep. The D. C. attempt to prepare the Carbonate by precipitating *Sulphate of Iron* ℥viij. with *Carbonate of Soda* (cryst.) ℥x. (each dissolved in 1 gallon of water). The mixture is set in a *covered* vessel for 6 hours; the supernatant fluid then removed by a syphon; the precipitate strongly pressed, dried at 212°, and preserved in a well-stoppered vessel.

Ferri Carbonas cum Saccharo, L. Ferri Carbonas Saccharatum, E. D. Saccharine Carbonate of Iron. Klauer's Ferrum Carbonicum Saccharatum (of the Continent).

Prep. L. *Sulphate of Iron* ℥iv., dissolved in Oij. of *Dist. Water*, is precipitated by *Carb. Soda* ℥ivß., dissolved also in *Dist. Water* Oij. The Carbonate being deposited, the supernatant fluid is poured off, and the precipitate frequently washed. To it *Sugar* ℥ij., dissolved in *Dist. Water* f℥ij. is added; the mixture then evaporated to dryness in a water-bath, and preserved in a well-closed bottle. E. D. Similar. The E. P. orders that the heat at which it is dried should not much exceed 120°.

Tests. Colour greyish-green, taste sweet and styptic, easily soluble in Muriatic acid with brisk effervescence. If the Carbonate of Iron is mixed with the Sugar as soon as possible after it is deprived of its water by filtration, it is found that it may then be dried with the heat indicated, without undergoing conversion into the Sesquioxide of Iron. The action of the Sugar in this and other similar cases is, that it prevents oxidation. (Klauer supposed that a definite compound is formed consisting of Protoxide and Sesquioxide of Iron, Carbonic acid, Sugar, and Water. He found 80 of Protoxide to 20 of Sesquioxide.) Fifty grains ought to yield 7·5 cubic inches of gas when decomposed by an acid.

Action. Uses. Tonic; and an excellent form of a Ferruginous preparation.

D. gr. x.—gr. xxx. It may be prescribed in the same doses in the form of

Pilulæ Ffrri Carbonatis, E. Pills of Carbonate of Iron.

Prep. Take *Saccharine Carbonate Iron* 4 parts, *Red Rose Conserve* 1 part, beat them into a proper mass and divide into 5 grain pills.

Pilula Ferri Composita, L. *Pilulæ Ferri cum Myrrhâ.* Compound Iron Pill.

Prep. Beat powdered *Myrrh* ℥ij. and *Carb. Soda* ℥j. together in a vessel first warmed. add *Sulph. Iron* ℥j., rub again; lastly, add *Treacle* ℥j. Beat the whole in a vessel previously warmed until incorporated.

These pills are the usual form for prescribing the Carbonate of Iron, but the saccharine matter is in too small a proportion to prevent the oxidation. Therefore, they should be made only when required, or the *Pil. Ferri Carbonatis* be substituted. gr. xx. contain 1 gr. $\frac{7}{10}$ of the Protocarbonate, in which there is 1 grain of the Protoxide.

D. gr. v. or gr. x.—℈j. 2 or 3 times a day.

The *Pilules de Vallel* are similar. *Pilules de Blaud* are made with Carb. Potash and Gum Arabic, and are a close imitation of the following mixture.

Mistura Ferri Composita, L. E. D. *Compound Mixture of Mars. Griffith's Antihectic or Tonic Mixture.*

Prep. L. Rub powdered *Myrrh* ℥ij. with *Spirit of Nutmeg* f℥j. and *Carb. Potash* ℥j., add *Rose Water* f℥xviij., and then *Sulph. Iron* in powder ℈ijß. Put the mixture immediately into a well-stoppered bottle. E. D. Similar.

Here the same changes take place; but Carbonate of Potash being employed instead of the Carbonate of Soda, we have a Sulphate of Potash left in solution. A hydrated Protocarbonate of Iron is suspended with Myrrh and the Spirit of Nutmeg as aromatics, while the Sugar no doubt assists in preventing the formation of Sesquioxide of Iron. Mr. Brande states that the best mode of making it is to triturate a fine piece of Myrrh into an emulsion with rose-water, add the Carbonate of Potash, Nutmeg, and Sugar, and lastly dissolve in it the Sulphate of Iron. If the bottle is kept full, the preparation will long remain unchanged : it should therefore be prescribed in draughts. (Ince P. J. i. 252.)

Inc. Acids and Acidulous Salts, Vegetable Astringents.

D. f℥j.—f℥ij. 2 or 3 times a day.

Soubeiran (ii. p. 434) describes some other preparations of the Carbonate of Iron, as the *Poudre Ferrugineuse*, in which Bicarb. Soda and Sulphate of Iron are mixed with Sugar, also *Poudre Ferée Gazeuse.*

Prep. Mix *Ferri Sulph.* gr. iij. carefully with pounded Sugar ℥ijß., add *Bicarb. Soda* in powder grs. liv., and coarsely pounded *Tartaric'* ℥j.; add to a bottle of water, cork it immediately and agitate.

A sweetish acidulous preparation of Iron, made agreeable by the effervescence of the Carbonic acid. The Iron may be increased, as the 3 grs. of the Sulphate will produce 1¼ gr. of the Carbonate of Iron.

The *Aqua Chalybeata* of Bewley and Evans is also an elegant and agreeable preparation of this metal. (*v.* Citrate of Iron.)

LIQUOR FERRI PERNITRATIS, D. Solution of Pernitrate of Iron.

Prep. Dilute *pure Nitric'* f℥iij. with *Dist. Water* f℥xvj., and introduce ℥j. of *Iron Wire* fine and clean. Leave them thus until gas ceases to be disengaged. Filter, and add enough water to fill up to Oiß.

Prop. This is a solution of the Pernitrate of Iron ($Fe_2 O_3$, $3 N O_5 = 242$) of Sp. Gr. 1·107. Being a preparation of the Sesquioxide it so far resembles the Tinct. Ferri Sesquichlor. It is said to be very efficient.

In the preparation, part of the $N O_5$ is spent in oxidizing the Iron; another part combines with the Peroxide formed.

D. f3ß—3j., diluted with water, or infusion of Quassia or Calumba.

TINCTURA FERRI ACETATIS, D. Tincture of the Peracetate of Iron.

Prep. Add *pure Acid Sulph.* f3vj. to *Dist. Water* f℥ix., and in this mixture, with the aid of heat, dissolve *Sulphate of Iron* ℥viij. Add next *pure Nitric'* f℥ß. diluted first with an ounce of *Dist. Water,* and evaporate to a thick syrup. Dissolve this in Oij. of *Rectified Spirit,* and *Acetate of Potash* ℥viij. in Oij. more; mix the solutions, and shake repeatedly in a large bottle. Filter through calico. Press the filter with its contents, filtering through paper what passes through, and adding it to the rest. The Sp. Gr. of this tincture is ·891.

In the first part of this preparation a solution of the Sulphate of Iron is converted into one of the Persulphate ($Fe_2 O_3$, $3 S O_3$), in the same way as in making the hydrated Sesquioxide, (q. v.). Both the Persulphate and the Acetate of Potash are soluble in Rect. Spirit. The solutions being mixed, a double decomposition takes place, resulting in the formation of Peracetate of Iron, and Sulphate of Potash. 3 Eq. of the Acet. Potash and 1 of Persulph. Iron are required for this.

$$Fe_2 O_3, 3 S O_3 + 3 (K O, \bar{A}) = Fe_2 O_3, 3 \bar{A} + 3 (K O, S O_3).$$

The Sulphate of Potash, being insoluble in the Spirit, is separated by filtration.

The Tincture is of a light-red colour. It forms an agreeable and efficient Chalybeate; but is said to be liable to spontaneous decomposition. It is decomposed by Acids, Alkalis, their Carbonates, and Vegetable astringents.

D. f3ß.—f3j.

POTASSII FERROCYANIDUM, L. E. D. Ferrocyanide of Potassium.

Ferrocyanate of Potash. Ferroprussiate of Potash. Prussiate or Yellow Prussiate of Potash. F. Cyanure de Fer et de Potassium. *G.* Cyaneisen Kalium. Blausaures Eisenkali.

This salt is officinal for the purpose of making Diluted Hydrocyanic acid. There is no formula for preparing it, because it is found in a very pure state in commerce. (Formula, $Fe\ Cy_3$, $K_2 + 3\ Aq = 213$.)

Prop. This salt is of a lemon-yellow colour, and transparent, with-

out smell, but having a cooling saline taste. The crystals are large and quadrangular, with more or less truncated edges and angles, derived from a primary octohedron; tough and flexible; Sp. Gr. 1·83. Soluble in 4 parts of cold and 2 of boiling water; insoluble in Alcohol. Heated to 212°, they lose about 13 per cent., or their 3 Eq. of water of crystallization, and are reduced to a white powder. At a red heat they are decomposed, Nitrogen escapes, Carburet of Iron and Cyanide of Potassium are left; but if exposed to the air, the latter absorbs Oxygen, and becomes Cyanate of Potash. This salt is not precipitated by the alkalis, nor by Sulphuretted Hydrogen, nor by Tincture of Galls, proving that the Iron is in a peculiar state of combination. With salts of the Peroxide of Iron, it produces precipitates of Prussian Blue, but white precipitates with salts of the Protoxide, which become blue after exposure to the air. With Lead, Zinc, Copper, &c., it forms different coloured precipitates, and therefore serves to ascertain the presence of these metals. Heated with diluted Sul′, Hydrocy′ is produced. If boiled with Binoxide of Mercury, Bicyanide of that metal is obtained in solution.

This salt is considered by some to be composed of 1 Eq. of Cyanide of Iron united with 2 of Cyanide of Potassium. But the view of Liebig is now most generally adopted, being sustained by analogy, and by its known properties. The Iron in it forms part of a supposed radical ($Fe\ Cy_3$), called Ferrocyanogen, and is not precipitable by tests. This radical is bibasic, and is united in this salt with 2 Eq. of Potassium.

This salt is prepared on a large scale by calcining animal matter, such as hoofs, chippings of horn, dried blood, pieces of hides, cellular membrane, the refuse of tallow melters, with Carb. Potash, in an iron pot with iron stirrers; the result is then thrown into water, dissolved, filtered, evaporated, and crystallized until pure.

Tests. Totally dissolved by water. A gentle heat evaporates 12·6 parts from 100 parts. It slightly (if at all) alters the colour of Turmeric. What it throws down from the preparations of Sesquioxide of Iron is blue. and that from the preparations of Zinc is white. What is thrown down from a solution of Sulphate of Iron is first white, and then blue; from a solution of Sulphate of Copper, brown. When burnt, the residue dissolved by H Cl is again thrown down by Ammonia: 18·7 parts of Sesquioxide of Iron are yielded by 100 parts. L.

Action. Uses. Sedative; but possessed of little activity; is rapidly absorbed and diffused through the secretions.

D. gr. x. to gr. xv.; but may be given in much larger doses.

FERRI SESQUIFERROCYANIDUM.

Sesquiferrocyanide of Iron. (*Graham.*) *Percyanide of Iron. Ferri Ferrocyanas*, U. S. Prussian Blue. *Ferro-prussiate of Iron. F.* Bleu de Prusse. *G.* Cyaneisen. Berlinerblau.

This substance, so well known by the name of Prussian Blue, was discovered in 1710 by Diesbach, a preparer of colours at Berlin.

Prussian Blue may be obtained perfectly pure, on a small scale, by double decomposition between Ferrocyanide of Potassium and an acid solution of Persulphate or Perchloride of Iron. In the arts it is made by calcining Potash and animal matter, adding this to 12 or 15 times its weight of water, and precipitating the clear solution obtained with 2 parts of Alum and 1 of the Protosulphate of Iron. It is not now officinal; but it is interesting in being the result of one of the tests for Hydrocyanic acid.

Berzelius, who ignored the existence of Ferrocyanogen, considered it a compound of 2 Eq. of the Sesquicyanide of Iron with 3 of the Protocyanide. ($2\ Fe_2\ Cy_3 + 3\ Fe\ Cy$.) Again, it consists ultimately of $Fe_7\ Cy_9$, and has thus been called a Percyanide of Iron. But, adopting the view of Liebig, it appears to be a Sesquiferrocyanide, not in the proportions of 2 to 3, but of 4 to 3, for the reason that the radical Ferrocyanogen is *bibasic*. ($4\ Fe + 3\ Fe\ Cy_3 = 430$.)

Now the test for Hydrocyanic is this. To an old solution of Sulphate of Iron (which contains some Persulphate), first supersaturated with caust. Potash, the suspected fluid is added. Then, with the Potash and Protosulphate, the H Cy produces Ferrocyanide of Potassium and some Sulphate of Potash; thus,

$$Fe\,O, S\,O_3 + 3\,K\,O + 3\,H\,Cy = K_2, Fe\,Cy_3 + K\,O, S\,O_3 + 3\,H\,O.$$

The Ferrocy. Pot. next immediately reacts on the Persulphate of Iron in the solution, and precipitates Prussian Blue.

$$3\,(K_2, Fe\,Cy_3) + 2(Fe_2\,O_3, 3\,S\,O_3) = (4\,Fe + 3\,Fe\,Cy_3) + 6\,K\,O, S\,O_3$$

On the addition of dilute $S\,O_3$, any Oxide of Iron precipitated will be dissolved; but the blue colour is unaffected.

This test is important and characteristic.

MISTURA FERRI AROMATICA, D. Aromatic Mixture of Iron.

Prep. Take *Iron-filings* ℥ß., *Peruvian Bark* (brown or pale) in coarse powder ℥j., *Calumba* sliced ʒ iij, *Cloves* bruised ʒ ij. Digest for 3 days in a close vessel, agitating occasionally with *Peppermint Water* q. s. to yield f℥ xij. of the filtered liquor. Add *Compound Tincture of Cardamoms* f℥ iij., and *Tincture of Orange-peel* fʒ iij.

Dr. Neligan says of this combination of aromatic tonics (holding in solution some Tannate of Iron), that, though apparently unchemical,

it is a most excellent tonic, much used in Dublin in the various states of debility attended with anæmia, in doses of f℥j.—f℥ij. two or three times a day. It is often called *Heberden's Ink*, from its black colour.

FERRI POTASSIO-TARTRAS, L. Ferrum Tartarizatum, E. D. Potassio-Tartrate of Iron. Tartrate of Potash and Iron. Tartarized Iron, and Chalybeated Tartar. Potasse Ferro-Tartras. *F.* Tartrate de Potasse et de Fer. *G.* Eisenweinstein.

Prop. The Tartrate of Potash and Iron is usually in powder of an olive-brown colour, without odour, and of a mild chalybeate taste. It is now often prepared in shining brittle scales of a dark-brown colour. Exposed to moist air, it deliquesces; it is soluble in 4 times its weight of water; slightly in Alcohol, more so in Wine. The solution is of a light-brownish colour, and remains unchanged for a considerable time. It is remarkable for not being decomposed by Ammonia or its Carbonate at any temperature, nor by the other alkalis or their Carbonates without the aid of heat. It is also unaffected by the Ferrocyanide of Potassium until a few drops of the stronger acids are added, when a deep blue colour is produced, showing that decomposition must have taken place. In these reactions it resembles the Ferrocyanides, and is thus supposed, like them, to contain Iron *in the acid part*, (*Potassæ Ferro-Tartras*, Pereira). Vegetable astringents cause the usual black precipitate. The salt consists of 1 Eq. of Tartaric Acid (which is bibasic), combined with 1 Eq. of Potash and 1 of the Sesquioxide of Iron. ($KO, Fe_2O_3, C_8H_4O_{10}=260.$) As Mr. Phillips considers Tartaric Acid to be ($C_4H_2O_5$), according to him 1 Eq. of the salt contains 2 Eq. of the acid. The present salt is stronger than that of the Pharm. of 1836, which was impure, containing some Tartrate of Ammonia. 100 grains now yield 34 grains of Sesquioxide of Iron.

Prep. L. ℥iv. of the *Sulphate* are oxidized by solution in *Dist. Water* Oj. with *Sul'* f℥ß., and boiling with *Nitric'* f℥j. The liquid is boiled to a syrup, mixed with *Dist. Water* Oxv., and f℥x of *Liq. Ammoniæ* added to precipitate the *Hydrated Sesquioxide of Iron.* This is washed, and placed aside for 24 hours. Then heat *powdered Bitartrate of Potash* ℥ij. in *Dist. Water* Oß. to 140° Fahr. Add gradually the moist Sesquioxide. Filter through linen to separate any excess of it. Evaporate the liquid, and dry the salt, or dry it as the Ammonio-citrate (q. v.).

E. Similar, except that there is an excess of the Bitartrate, so that the acid liquor has to be neutralized by Carbonate of Ammonia, and the dry salt contains some Tartrate of Ammonia.

D. Similar to L.; but the Oxide is precipitated by Potash.

The formation of Sesquioxide has been explained previously. 1 Eq. of this (80) is taken into the composition of the Supertartrate of Potash ($KO, C_8H_4O_{10}, HO=189$), taking the place in it of the equivalent of water. So that an acid salt becomes now converted into a neutral salt.

The preparation is not always the same. These atomic proportions would be certain to produce a pure salt. (P. J. ix. 444.) The analyses of Soubeiran, and more lately that of Mr. Bastick (P. J.), indicate the formula for this salt which is given above.

Tests. Totally soluble in water, and not attracted by the magnet: (if improperly prepared, a large portion is insoluble, and the magnet attracts the residual oxide). The solution does not change either Litmus or Turmeric; it is not rendered blue by Ferrocyanide Potassium, nor anything precipitated from it by any acid or alkali. P. L.

Inc. Strong acids, Lime-water, Acetate of Lead, Hydrosulphuric′, Vegetable Astringents.

Action. Uses. Chalybeate Tonic, mild in taste, soluble and efficient.

D. gr. x.—ʒß. in pill, or solution with some aromatic.

VINUM FERRI, L. Steel Wine.

This is a popular but weak Chalybeate preparation, omitted in the last, but revived in the present Pharmacopœia. It has the disadvantage of being uncertain in strength.

Prep. Digest *Iron Wire* ℥j. for 30 days in *Sherry Wine* Oij. and strain.

Most of the Bitartrate of Potash of Grape juice crystallizes out when the Alcohol is formed in it by vinous fermentation. But being very slightly soluble in a mixture of Alcohol and Water, some of it is left behind in the Wine. Good Sherry contains but very little. By the agency of air and water some of the Iron is Peroxidized. This Peroxide forms with the Bitart. Potash a Potassio-Tartrate of Iron. (*Vide Suprà.*)

From the Wine sometimes containing other acids, small quantities of Acetate or Malate may be formed at the same time. Thus in proportion as Wines, or different kinds of Sherry, differ in acidity, so will this preparation vary in strength. Cape Wine is often used, and has the double advantage of being cheap, and of containing more acid. Mr. Donovan recommends Hock.

A good substitute for Steel Wine may be made by dissolving the Potassio-tartrate immediately in Wine. The L. P. wine contains on an average only 16 grs. of Peroxide in a pint.

Action. A weak Stimulant Tonic.

D. fʒj.—fʒiv. or more.

FERRI AMMONIO-TARTRAS. Ammonio-Tartrate of Iron.

In the same way that Sulphate of Alumina, by combining with the Sulphates of Potash, Soda, or Ammonia, will form either Potash, Soda, or Ammonia Alum, so various double salts may be formed by presenting different bases with Iron to the Citric and Tartaric acids. The Ammonio-Tartrate of Iron is one of these, which has for some

time been prepared as a substitute for the Tartrate of Potash and Iron. It is of a dark-brown colour, in brilliant scales, or in angular grains, resembling Kino; its powder is of a brown colour, like Iron-rust. It has a mild ferruginous taste; is soluble in rather more than its weight of Water at 60°; not decomposed by boiling water; insoluble in both Alcohol and Ether. It is composed of 1 Eq. of Tartaric acid, 1 of the Sesquioxide of Iron, 1 of Ammonia, and 4 of water. A formula for preparing it is given by Mr. Procter, junr. in Amer. J. of Pharm., by decomposing Supertartrate of Ammonia, with fresh-made Hydrated Sesquioxide of Iron. *v.* P. J. i. 291. It is an eligible preparation of Iron, and may be given in doses of gr. iij. to gr. viij. in aqueous solution, or in pill, or with some confection.

FERRI CITRAS. Citrate of Iron.

M. Beral, in 1831, introduced to the notice of the profession several preparations in which Iron is combined with Citric acid. Of these the Citrate of the Peroxide of Iron is made by mixing a boiling solution of Cit′ ℥iv. in Aq. Dist. ℥xvi., with moist *Hydrated Sesquioxide of Iron* about ℥viij. It is obtained (by drying its solution spread out on glass) in thin and transparent laminæ of a beautiful garnet hue; has an acid and not disagreeable styptic taste. It dissolves slowly in cold water, but more readily in boiling water. M. Beral has proposed a Protocitrate of Iron, which is white and pulverulent, with a strong chalybeate taste, and also a Citrate of the Magnetic Oxide of Iron. But the name *Citrate of Iron* is most generally applied to a preparation in which the excess of acid has been counteracted by Ammonia, and which thus becomes converted into the following:

FERRI AMMŎNIO-CITRAS, L. D. Ammonio-Citrate of Iron. *Ferric Citrate of Ammonia.*

This elegant chalybeate has been long in use, and a formula for preparing it has been introduced in the P. L. of 1851.

Citric acid ($C_{12} H_{11} O_5$) is tribasic, *i.e.* it requires for its neutralization 3 Eq. of a base. This, when pure, is a regular double salt, containing 3 Eq. of Ammonia united to 1 of Cit′, and 3 of the Peroxide of Iron combined with a second Eq. of the acid. Ferri Ammonio-Citras $= 3\ N\ H_3,\ 3\ Fe_2\ O_3 + 2\ \bar{Ci} = 621$.

Prop. As prepared below, it is in beautiful shining translucent scales of a garnet colour. It is very soluble in water; the solution is neutral; its taste at first sweet, and then astringent. It is almost insoluble in Alcohol. The aqueous solution (like that of the Potassio-Tartrate) is not precipitated by Ammonia, nor by Ferrocyanide of Potassium, unless an acid be first added, when a blue precipitate falls. Mr. Phillips considers that the salt varies slightly in composition.

Prep. L. Dissolve *Sulphate of Iron* ℥xij., and *Carbonate of Soda* ℥xiiß., separately in boiling *Aq. dest.* Ovj. Mix the solutions while hot, and set by that the precipitate may subside. Pour off the supernatant liquor, and wash frequently with water. Add *Citric Acid* ℥vj. and dissolve both with the aid of heat. When cold, add *Solution of Ammonia* f℥ix. and evaporate to a syrup. Dry this; spread out very thinly on flat earthenware plates, with a gentle heat. Keep it in a well-stoppered vessel.

D. The formula of the D. C. would prepare a salt with an excess of Citrate of Ammonia. The Hydrated Peroxide of Iron is substituted for the precipitated Carbonate.

In the L. process a Carbonate of Iron is first prepared. This, by exposure, is mainly changed into the hydrated Sesquioxide. (q. v.) But some Carbonate must remain. On the addition of Cit′, a solution is obtained of Citrate of Sesquiox. Iron with excess (1 Eq.) of Cit. acid. By the addition of Ammonia, this excess is neutralized, and the double Citrate made. From the employment of the Carbonate, some *Protocitrate* may also be contained in this preparation. By drying the solution spread out on plates, it is obtained in thin transparent scales.

Tests. L. P. It is soluble in water; the solution changes the colour neither of Litmus nor of Turmeric; nor on the addition of Ferrocy. Pot. does it become blue; but Potash or solution of Lime being added, the Sesquioxide of Iron is precipitated and Ammonia evolved.

From 100 grs. dissolved in water, on the addition of Potash, about 34 grs. of Sesquioxide of Iron are precipitated.

Inc. Liquor Potassæ. Strong Acids.

Action. Uses. It is a mild preparation, pleasant to the taste, and useful for children and weak persons; may also be given with Ammonia or the Alkaline Carbonates. It is neither irritant nor astringent.

D. gr. v.—gr. x.

Double Citrates of Iron, with Zinc, Soda, Potash, and Magnesia, are sometimes prepared. For *Citrate of Quinine and Iron*, *Vide* Cinchona.

Aqua Chalybeata. One of the most elegant and agreeable forms which has yet been proposed for the exhibition of Iron is an effervescing solution of Citrate of Iron flavoured with Orange-peel, called *Aqua Chalybeata* by Messrs. Bewley and Evans, and for which the name of Chalybeate Champagne has been proposed. It has been examined and reported upon by Dr. Ure and by Mr. Brande. It consists of a solution of Citrate of Iron highly charged with Carbonic acid gas, and flavoured with Orange-peel. It is sent out in six-ounce bottles, which afford on analysis gr. vij. $\frac{9}{10}$ of Peroxide of Iron, corresponding to gr. xiij.ß of the Citrate of Iron. Two ounces, or a wineglass full two or three times a day, forms a dose which is grateful to the taste, and suitable to the most delicate in constitution, and to children, at the same time that it is effective as a tonic.

LACTATE OF IRON. FERRI LACTAS. Lactate of the Protoxide of Iron is a mild chalybeate, which is obtained in a greenish-white powder, or in greenish acicular crystals, by the direct action of a dilute solution of Lactic acid on Iron-filings. When it is dissolved, the Iron passes to a higher state of oxidation, and the solution becomes yellow. It may be prescribed in the form of Lozenges or of Syrup.

MALATE OF IRON is a form of preparation in use in the Prussian Pharmacopœia. It is procured by digesting one part of Iron nails or wire along with four parts of Apple-juice for some days, then evaporating the liquid to one-half, filtering and concentrating to the consistence of an extract.

PHOSPHATE OF IRON has been lately used as a remedy in Amenorrhœa, and for application in solution to cancerous ulcers. It is prepared by precipitating a solution of Sulphate of Iron (℥v.) with one of the rhombic Phosphate of Soda (℥vj.) It is insoluble in water; soluble in H Cl; of a greenish blue colour. Dr. Routh has introduced a *Soluble Super-phosphate*, obtained by adding as much of the above preparation to a boiling solution of phosphoric acid, as the latter will dissolve. (P. J. x. 534.) The solution is greenish, and from it the salt may be obtained by evaporation.

FERRI VALERIANAS, D. Valerianate of Iron.

This is a reddish-brown coarse powder, with a peculiar smell, which, however, is not quite that of Oil of Valerian. It is insoluble in water, but soluble in Alcohol, in which it may be given. On the application of heat, or when it is dissolved in H Cl, Valerianic acid is set free.

Prep. A solution in *Aq.* f℥viij. of *Persulphate of Iron* prepared from ℥iv. of the *Sulphate*, is precipitated by a solution of *Valerianate of Soda* ℥v. ʒiij. in *Aq.* f℥x. The precipitate is washed on a filter, dried, and kept in a well-stoppered vessel.

Citrate of Iron flavoured with Oil of Valerian has been frequently substituted for this preparation, but may easily be detected by its solubility in water. (P. J. viii., 577.)

Use. It is sometimes administered in Amenorrhœa, or in Anæmia combined with nervous disorder.

D. ½ gr.—1 gr. 3 times a day. (*v.* Sodæ Valerianas.)

ZINCUM, L. E. D.

Zinc. *F.* Zinc. *G.* Zink.

Zinc is considered to have been known as a distinct metal only since the time of Paracelsus. It has long been imported from China

into India. The name *Tutenague*, by which Chinese Zinc was known in commerce, is evidently derived from the Tamul, *tutanagum* (Essay Hind. Med. p. 100), and it was at one time called Indian Tin (*Stannum Indicum*). The ores of Zinc were no doubt employed by the ancients in making Brass.

Zinc (Zn=32) is found in the state of an Oxide, but principally as a Sulphuret (*Blende*), and an impure Carbonate (*Calamine*). From both ores it is first converted into an Oxide by the process of roasting, and then reduced to the metallic form by the aid of Carbonaceous matter, when it may either be fused or sublimed. Until purified by a second distillation, it contains as impurities small portions of other metals, as Iron, Copper, Arsenic, &c.

Prop. Zinc is white, with a shade of blue, and of considerable brilliancy. Sp. Gr. from 6·8 to 7·2. At ordinary temperatures it has little ductility or malleability, but is hard and tough. When heated from 210° to 300°, it becomes ductile, and may be drawn into wire or beaten or rolled into thin sheets, which may also be done at ordinary temperatures, if it be very pure. At 400° it becomes brittle, and may be powdered. It melts at 773°, and, on slowly cooling, crystallizes in four-sided prisms, with its fracture displaying a lamellated structure. At a white heat it may be volatilized in close vessels: but in contact with the air, it burns vividly, diffusing white fumes of Oxide. Exposed to the air, or kept under water, Zinc becomes covered with a thin film of Suboxide, which protects it.

Tests. Almost entirely dissolved by diluted Sulphuric acid (leaving only a scanty greyish-black residuum, E.). This solution is free from colour, and has the other characters of the Sulphate of Zinc. q. v.

Action. Uses. Zinc is not used medicinally. Zinc vessels for keeping articles of diet are not without danger.

Zinci Oxydum, L. E. D.

Oxide of Zinc. *Lana philosophica. Flores Zinci.* F. Oxide of Zinc. *G.* Zinkoxyd.

This Oxide has been long known, in an impure state, by the name of *tutty*, which appears to be of Oriental origin, as the Sulphate is still called *suffed tutia*, or white tutia; the Sulphates of Iron and Copper being called *green* and *blue tutia.* (Hindoo Med. p. 100) So great is the affinity of Zinc for Oxygen, that it precipitates many other metallic oxides, when in solution, in the form of their respective metals.

Prop. Oxide of Zinc (Zn O=40), when pure, forms a light flocculent powder of a white colour, devoid of taste and smell, insoluble in water or Alcohol, but soluble in acids and in the caustic fixed alkalis. When heated to a low red heat, it acquires a yellow colour, which disappears again when it cools, unless Iron be present. At a low white heat it may be melted, and when this is increased it is

volatilized. It is thrown down in a hydrated form, when an alkali is added to a solution of a salt of Zinc. When pure, its neutral solutions in acids throw down a white precipitate on the addition of Sulphuretted Hydrogen, or Ferrocyanide of Potassium, but H S causes no precipitate in an acid solution. Comp. Zn $80 + O\ 20 = 100$.

Oxide of Zinc used to be prepared by the action of heat and air on the metal in a crucible, when it becomes oxidized by abstracting Oxygen from the atmosphere. So prepared, it is usually gritty, from containing small particles of metal, some of which may be got rid of by the process of elutriation. The L. and E. P. prepare it by precipitation.

Prep. L. Dissolve *Sulphate of Zinc* ℔j. in *Aq. dest.* Oxij., and *Sesqui-carb. Ammonia* ℥viß. in *Aq. dest.* Oxij. and filter. Mix. Wash the precipitate thoroughly with water. Lastly, burn it for 2 hours in a strong fire. E. Similar. The D. C. prepare it by heating the Carbonate to a red heat in a covered crucible.

The precipitation was formerly effected with Ammonia; but this, like the other caustic alkalis, when in excess, redissolves the precipitate. Both the salts employed becoming decomposed, a Sulphate of Ammonia remains in solution, and the Carb′ combining with the Oxide of Zinc which is set free, an insoluble Carb. Zinc is precipitated. This being washed and heated, the Carb′ is expelled with any adhering Ammonia, and a pure Oxide of Zinc is left; but it is often sold without being calcined.

Tests. Yellowish-white; tasteless; entirely soluble in dil. Nit′ without effervescence: this solution is not affected by Nitrate of Baryta, but gives with Ammonia a white precipitate entirely soluble in an excess of the test. E. P. Carb. Zinc is often sold in the shops for the Oxide of Zinc; and Mr. Redwood (P. J. ii. 506) states that another kind of Oxide is a mixture of basic Sulph. Zinc and of Hydrated Oxide, and that the Oxides of Zinc of commerce are either basic Carbonates or basic Sulphates, containing only from 64 to 67 per cent. of Oxide. Any Sulphate of Zinc will be detected by the Barytic salt; any Chloride, by Nitrate of Silver; Iron by the yellow colour of the Oxide; and if Carbonates of Lime or Lead are used for adulterating, they will effervesce with acids, and also remain undissolved (as well as the Iron) in Ammonia.

Inc. Acids and acidulous salts, also caustic alkalis.

Action. Uses. Ext. Desiccative. *Int.* Tonic and Antispasmodic.

D. gr. j.—gr. v. or more, twice a day, in pill.

Unguentum Zinci, L. E. D.

Prep. L. Mix well together *Oxide of Zinc* ℥j. and *Lard* ℥vj.
E. D. Same proportions: instead of Lard, the E. orders *Simple Liniment;* the D. P. *Ointment of White Wax.*

A mild siccative Ointment.

ZINCI CHLORIDUM, L. D. Chloride of Zinc. *Butter of Zinc.*

Chloride of Zinc has been highly recommended as a caustic by foreign surgeons and by the late Mr. Liston. It is a Protochloride ($Zn\,Cl = 68$). Soluble in water and alcohol; very deliquescent in the air; it melts at 212°, and is volatilized by a red heat. As prepared below, it is in solid snow-white fragments, inodorous, and with a strong metallic taste.

Prep. L. Mix *Hydrochloric'* Oj. with *Dist. Water* Oij., and add *Zinc* in small pieces ℥vij.; the effervescence being nearly finished, heat until bubbles cease to be evolved. Pour off the liquor. Strain, and evaporate it until the salt be dried. After melting it by a red heat in a lightly covered crucible, pour it out on a flat and smooth stone. Lastly, when it has cooled, break it into small pieces, and preserve in a well-stoppered bottle.

The D. C. prepare it by evaporating down the Liq. Zinci Chloridi (q. v.).

In the above process the Chlorine of the $H\,Cl$ unites with the Zinc, forming a soluble Chloride, while the Hydrogen gas escapes with effervescence. The heating to redness is necessary to get rid of the water, for which it has so great an affinity.

Tests. Colourless, deliquescent, soluble in water and in rectified Spirit. Hydrosulphuric acid and Ferrocyanide of Potassium cause white precipitates in the watery solution. What is precipitated by Ammonia or Potash, is white, and soluble in excess; and that by Carb. Ammonia or Carb. Potash, also white, but undissolved by an excess. L. P.

Action. Uses. A powerful spreading caustic; used to destroy Nævi, Lupus, and cancerous sores. At the same time it destroys any bad odour. As with Caustic Potash, the neighbouring parts should be protected by lint or plaster. It may first be made into a paste with lard; or it may be mixed with flour or Sulphate of Lime, and then cast into sticks. It is sometimes given internally in epilepsy.

D. gr. ß.—ij.

ZINCI CHLORIDI LIQUOR, D. Solution of Chloride of Zinc.

Prep. Water and *Muriatic Acid,* of each Oij., are mixed together, and gradually added to *Sheet Zinc* ℔j. in a porcelain capsule, applying heat until the metal is dissolved. It is filtered, and *Solution of Chlorinated Lime* ℥j. added. The whole is concentrated to Oj. It is cooled, mixed with *Prepared Chalk* ℥j., and shaken occasionally for 24 hours. Lastly, filtered, and kept in a well-stoppered bottle.

This solution will contain Chloride of Zinc, but is liable also to contain some Chloride of Calcium (*v.* Calx Chlorinata). The chalk neutralizes any excess of acid. The Sp. Gr. of the liquid is 1·593. Sir William Burnett's *Disinfecting Solution* is also a solution of Chloride of Zinc, having a Sp. Gr. of 2·0. It was first introduced to preserve wood and clothes, but is now used for deodorizing purposes. The Zinc combines with the Sulphur of Sulphuretted Hydrogen, and the Chlorine unites with the Hydrogen, so that by this action the

noxious gas is neutralized (Sulphuret of Zinc and Hydrochloric′ being produced). Dr. Pereira thinks this solution has little effect on Sulphuretted Hydrogen, except when the latter is in solution and combined with Ammonia. The solution coagulates Albumen and Gelatine, and thus becomes of use in preserving anatomical preparations, &c. The D. C. obtain the dry Chloride from it.

CALAMINA.

Calamine. Native Impure Carbonate of Zinc. *F.* Calamine. *G.* Kohlensaures Zinkoxyd.

Calamine, or Carbonate of Zinc ($Zn\,O, C\,O_2 = 62$) is found in various parts of the world. But the same name is applied to two very distinct ores, one being a Silicate of Zinc, and the other, which is alone officinal, a Carbonate of Zinc. It is found in compact or earthy masses, readily scratched with a knife, and breaking with an earthy fracture. It is also found crystallized. Sp. Gr. 3·4 to 4·4. The colour is various; but, as usually seen, it is grey, pinkish, or reddish-yellow. It dissolves in Nitric and other acids with effervescence, and is not rendered electric by heat, by which characters it is easily distinguished from the Silicate, which is also called Electric Calamine. The Carbonic acid and Zinc will be indicated by their respective tests. The crystallized variety is anhydrous.

CALAMINA PRÆPARATA, L. E. ZINCI CARBONAS, D. Prepared Calamine. Carbonate of Zinc.

Prep. L. This is native Carbonate of Zinc, burnt, and rubbed to a most subtle powder, and washed.

The D. C. prepare Carbonate of Zinc by precipitating the solution of the Chloride with one of Carb. Soda; washing, and drying in a water bath.

By the process of roasting Calamine, some of the Carb′ and water are expelled, and a portion of Oxide of Zinc is formed. The mass being subjected to elutriation, it is often, like Chalk, prepared in little conical masses. It usually contains many impurities, as Oxide of Iron and other metals, and is adulterated with Sulph. Baryta, Carb. Lime, &c. Much of the Calamine of commerce has been shown by Dr. R. D. Thomson and Mr. Murdoch to contain no Zinc, but to be Sulph. Baryta coloured with Armenian Bole. The D. preparation is very pure.

Tests. Almost entirely soluble in Sul′ with some effervescence, unless it has been too much burnt. The solution gives with Potash or Ammonia a precipitate soluble in an excess of the alkali. L. Any impurities will remain undissolved—of a reddish-yellow, if Iron, and the solution will become blue with Ammonia, if Copper is present.

Action. Uses. A desiccant powder for excoriations in children.

CERATUM CALAMINÆ, L. E. Cerate of Calamine. *Turner's Cerate.*

Prep. L. Mix *Olive Oil* Oj. with melted *Beeswax* ℥viiß., then remove from the fire; and when they begin to thicken, add *Prepared Calamine* ℥viiß., and stir constantly till they are cold. E. Similar.

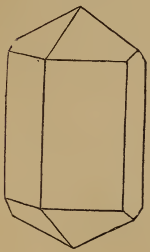
ZINCI SULPHAS, L. E. D.

Sulphate of Zinc. *Sal Vitrioli.* *White Vitriol.* *F.* Sulfate de Zinc. *G.* Schwefelsaures Zinkoxyd.

This salt is found native in some places. It is known in India by the name of *suffed tootia*, or white vitriol.

Prop. Sulphate of Zinc ($Zn\,O, S\,O_3 + 7$ Aq.$=143$) is a colourless salt, without odour, but having a disagreeable astringent and metallic taste. The crystals are transparent, large or small, right quadrangular prisms terminated by four-sided pyramids (sometimes six-sided, from two opposite edges being truncated), often resembling those of Nitre, or, when small and acicular, like those of Epsom Salts. Like the crystallised Sulphates of Iron and Magnesia, they contain 7 Eq. of water. Exposed to dry air, they effloresce; they are soluble in $2\frac{1}{2}$ parts of cold, and in less than their own weight of boiling water; insoluble in Alcohol. Heated, they melt in their water of crystallization, which becomes dissipated, except one Eq. which requires from 266° to 284° of temp. to expel it. At a still higher degree, the acid is expelled, and only Oxide of Zinc left. This Oxide is also precipitated when the caustic alkalis are added to a solution of Sulphate of Zinc, and is redissolved in an excess of the Alkali. The Carbonated alkalis throw down Carbonate of Zinc, Ferrocyanide of Potassium a white gelatinous-looking precipitate, and Sulphuretted Hydrogen a white Sulphuret of Zinc. Chloride of Barium and Acetate of Lead will throw down white precipitates of Sulphates of Baryta and of Lead. There are several varieties of this Sulphate of Zinc, forming Subsulphates; but the officinal salt is composed of $Zn\,O\ 28 + S'\ 28 + \text{Aq.}\ 44 = 100$.

Fig. 26.



Sulph. Zinc may be prepared either by roasting the Sulphuret of Zinc (*i.e.* Blende), or allowing it to oxidate spontaneously. In either case the Sulphuret acquires 4 Eq. of Oxygen (from Zn S becoming $Zn\,O, S\,O_3$). The product is lixiviated and crystallized. The E. C. purify the commercial Sulphate by crystallization, until it is obtained pure according to the tests enumerated below.

The D. C. obtain it by dissolving pure Zinc in Sulphuric Acid, adding some Nitric Acid to assist in the oxidation of the metal, and prevent the formation of Subsulphates. The common White Vitriol

of commerce may also be purified by immersing a strip of metallic Zinc in the solution; by which the other metals are precipitated.

Tests. Sulphate of Zinc, in its crude state, contains several metallic impurities, such as Copper, Lead, and Iron,—the last almost always, even in its purified state. It is totally dissolved by water; what is thrown down by Ammonia is white, and when the Ammonia is added in excess, it is again dissolved. L. P. In the E. P. a solution in six waters is directed to be boiled with a little Nitric Acid, and treated as above with Ammonia: no yellow precipitate (*Peroxide of Iron*) remains, or a trace only, and the solution is colourless. Magnesia as well as Iron will be detected by its insolubility, Copper by a blue coloured solution. Tincture of Galls should cause no precipitate. (E.) Arsenic or Cadmium may be detected by adding excess of Sul′ to the solution of the Sulphate, and then passing a stream of Hydrosulphuric′ through it: the Arsenicum and Cadmium are thrown down in the form of Sulphurets. (*p.*) Zinc is not precipitated by H S from an acid solution.

What is precipitated from the solution of 100 grains by Sesqui-carb. Ammonia, is reduced at a high temperature to 27·9 grains of Oxide of Zinc. (L. P.)

Inc. Alkalis, and their Carbonates, Lime-water, Salts of Barium and of Lead, Astringent Vegetables.

Action. Uses. Ext. Astringent. *Int.* Astringent; Tonic; in large doses, Emetic.

D. gr. j.—gr. ij. two or three times a day. gr. x.—℈j. in solution as an emetic.

Off. Prep. Liquor Aluminis Compositus.

Zinci Acetas, D. Acetate of Zinc.

Acetate of Zinc ($Zn\,O,\ C_4\ H_3\ O_3+7$ Aq.$=154$), has been used internally as a tonic, and topically in solution as an astringent lotion. It is now omitted from the L. and E. Pharm. It occurs in oblique rhomboidal prisms, of a silky appearance; very soluble in water and spirit; slightly efflorescent in the air; having a bitter metallic taste. By heat they are first fused, then decomposed. Sulph. Acid disengages Acetic, which may be recognized by its odour. Zinc may be recognized in the solution by its appropriate tests.

Prep. The solution may be readily made by a double decomposition. 190 grains of cryst. Acetate Lead mixed in solution with 143 grains of cryst. Sulphate Zinc, produce 91 grains of (anhydrous) Acetate Zinc, and 152 of insoluble Sulphate Lead, which may be separated by a filter.

The D. C. prepare it by immersing a piece of sheet Zinc in a solution of Acetate Lead. The Acetic′ leaves the Lead; Acetate of Zinc is formed, and metallic Lead precipitated. As the Zinc often contains Iron and Manganese, a solution of Chlorinated Lime is added to the hot concentrated liquid, by which those metals are thrown down as insoluble Peroxides. The solution is evaporated and crystallized.

Tests. In the solution, any Lead may be detected by H S; any

Iron by Ferrocyanide Potassium, giving a blue precipitate; and any Sulphuric Acid by a precip. with Chlor. Barium, insol. in Nitric′.

Uses. An astringent lotion or injection for Ophthalmia, Gonorrhœa, and Ulcerations.

Citrate of Iron and Zinc has been used. It is a tonic and astringent, similar in composition to the Ammonio-Citrate of Iron, q. v.

ZINCI VALERIANAS, D. Valerianate of Zinc.

Formula ($Zn\,O$, $C_{10}\,H_9\,O_3$). It is produced by a double decomposition between Valerianate Soda and Sulph. Zinc. It occurs in minute transparent colourless crystals, nearly insoluble in cold, but soluble in hot water. Strong acids or a boiling temperature decompose the solution, setting free Valerianic′, which may be recognized by its odour. A similar odour is observed in the salt itself.

Prep. Dissolve *Valerianate of Soda,* ℥ii ß. *Avoird.* in *Dist. Water* Oj., and *Sulph. of Zinc* ℥ij. ʒvij., in *Water* Oj. Raise both to a temperature of 200°. Mix. and skim off the crystals produced. (By successive evaporations at 200° fresh crystals are obtained. They are washed in cold water sufficient to cover them, and dried at a heat not exceeding 100°.)

The soluble Sulphate of Soda is left in the mother liquor, and removed by washing. That no cryst. of this may be obtained, the liquid is not to be evaporated beyond f℥iv.

Tests. The Sulphate or Acetate of Zinc, to which Oil of Valerian has been added, are frequently substituted. They may be detected by their solubility, and by the solution having on its surface a film of oil. When a spurious specimen is heated with an acid, little or no Valerianic′ can be separated by distillation. (*v.* VALERIANATE OF SODA.) Zinc may be recognised by its tests.

Action. Uses. A tonic and antispasmodic in Hysteria and Epilepsy.

D. gr. j.—iij. in pills.

CUPRUM, L.

Copper. Venus of the Ancients. *F.* Cuivre. *G.* Kupfer.

Copper was, with Gold and Silver, one of the most anciently known of the metals. It is abundantly diffused in nature, being found native as an Oxide, a Sulphuret, and as a Sulphate, Carbonate, Arseniate, and Phosphate.

Copper ($Cu = 32$) is a reddish-coloured metal, of a disagreeable smell when rubbed, and of an unpleasant taste. Sp. Gr. 8·85 to 8·95; very ductile and malleable, and possessed of considerable tenacity. It melts at 1996° (Daniell). Its crystals, obtained on the cooling of the fused metal, are rhomboidal, but those of native Copper are cubes or octohedrons. It oxidizes slowly in the atmosphere, becoming covered with a green crust of Subcarbonate of Copper. It decomposes water only at a bright red heat. Its oxygenation is much promoted by

many acids, as the Nitric, and caused even by the weaker acids when exposed to the air, also by alkaline and fatty substances. There are two Oxides of Copper. One, a *Suboxide* or *Dinoxide* ($2\ Cu, O=72$), also called Red Oxide of Copper, is found native in octohedral crystals; when hydrated, it is of a lively yellow colour. The *Protoxide* ($Cu\ O=40$), or Black Oxide of Copper, is, as its name indicates, of a black colour, but blue when hydrated. It combines readily with acids, and thus forms the base of the ordinary salts of Copper, which are of a blue or green colour when hydrated, but white when anhydrous.

Copper is easily recognized by its colour, taste, and smell when rubbed. It may be dissolved in Nitric acid, when it may be known by reagents, as in solution of Sulphate of Copper.

Metallic Copper is not possessed of any action on the system, if pure; but when oxidized, or combined with acids, is a powerful poison.

Use. Pure Copper is employed in the P. L. as a test. If a bright strip of it be introduced into a solution of Nitrate of Silver, the acid combines with the Copper, and the Silver is precipitated on its surface as a white powder. Mercury is also precipitated thus from its solutions, but may be distinguished by the white crust running into globules when rubbed with the finger, and leaving behind a bright amalgamated surface.

Antidotes. Evacuate the Stomach; administer white of eggs, and milk, tepid diluents, antiphlogistics.

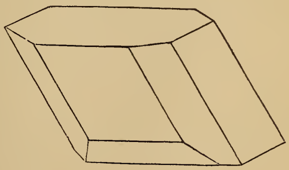
Cupri Sulphas, L. E. D.

Sulphate of Copper. *Cuprum Vitriolatum.* *Vitriolum Cæruleum.* Blue Vitriol. *Blue Stone.* *F.* Sulfate de Cuivre. *G.* Kupfer-Vitriol.

This salt is produced naturally in the water of many mines. It was no doubt employed by the ancients, as it was by the Arabs and Hindoos: by the latter it is called *neela tootia*, or blue vitriol.

Prop. Sulphate of Copper ($Cu\ O, S\ O_3+5\ Aq.=125$) is of a fine blue colour, without odour, but having a powerful styptic disagreeable taste. Usually seen in fragments of large rhomboidal crystals. Sp. Gr. 2·2. Exposed to the air, these effloresce, from losing a portion of their water of crystallization. They may be dissolved in four times their weight of cold and in twice their weight of boiling water. When heated,

Fig. 27.



the crystals first melt in, then lose, their water of crystallization, and fall into a greenish-white crumbly powder; at a still higher heat, the acid is decomposed, sulphurous fumes escape, and the Oxide is left, of a brown colour. The solution is of a light or deep blue colour, according to its strength, from which the alkalis throw down precipitates of a more or less bluish-green colour; if a small quantity be added, a Subsulphate is precipitated; but if a larger quantity, a hydrated Oxide. An azure-blue precipitate is produced by Ammonia, which is redissolved by an excess of the precipitant. Sulphuretted Hydrogen throws down a brownish-black precipitate of Sulphuret of Copper. Ferrocyanide of Potassium a reddish-brown one of Ferrocyanide of Copper. Arsenious acid, if a little alkali (as Ammonia) be added at the same time, throws down a grass-green precipitate of Arsenite of Copper. A polished Iron or Zinc plate, introduced into the solution, becomes covered with a metallic coating of Copper. By these tests the presence of Copper is indicated, that of the Sul′ will be revealed by its tests. Comp. Cu O 34·48 S′ 34·48 Aq. 41·04=100.

Prep. Sulphate of Copper may be prepared by boiling Copper in diluted Sul′. This acid being decomposed Sulphurous Acid escapes. 1 Eq. Ox. combines with the metal, which dissolves in the remaining Sul′. More commonly it is made by exposing the Sulphuret to air and heat, when both the Sulphur and metal, becoming oxidated, combine to form the Sulphate. As the native Sulphuret′ contains both Iron and Copper, so does the salt produced contain Sulphates of Iron and of Copper. A great portion of the Sulph. Iron is got rid of by fresh exposure to heat and air, when it is decomposed and the Iron peroxidized, and the Sulphate of Copper separated by solution and crystallization. This commercial Sulphate is the Cupri Sulphas Venalis, L. P. The L. C. purify it by dissolving ℔iv. in boiling *Dist. Water* Oiv., filtering, evaporating, and crystallizing.

Tests. Totally soluble in water. In the air it becomes slightly pulverulent, and of a greenish colour. Whatever Ammonia throws down from its solution, an excess of Ammonia dissolves. L. P. If any Iron be present, it will become green in the air, and not be dissolved by the Ammonia.

Inc. Alkalis and their Carbonates, and many salts, as Borax, Chloride of Calcium, Tartrate of Potash, salts of Lead, Nitrate of Silver, Astringent Vegetable Infusions.

Action. Uses. Irritant, Escharotic, Astringent, Tonic. In large doses, Emetic.

D. gr. ß—gr. ij. Tonic. gr. iv.—xij. Emetic.

CUPRI AMMONIO-SULPHAS, L. D. Cuprum Ammoniatum, E.

Ammoniæ Cupro-Sulphas. Ammonio-Sulphate of Copper. *F.* Cuivre Ammoniacal. *G.* Kupfer Salmiak.

This preparation forms a beautiful azure-coloured powder, which has a strong odour of Ammonia, and a disagreeable Coppery taste. It is prepared by rubbing together Sulph. Copper and Sesquicarb. Am-

monia; and as a portion of the latter remains in excess, the Ammoniacal odour and an alkaline reaction on test-paper are observed. From the volatile nature of the Ammonia, it escapes when the preparation is exposed to the air, or is too much dried, and is therefore apt to vary in its properties. When well made it ought to dissolve in water; but if there be a deficiency of Sesquicarb. Ammonia, it is not only insoluble, but is further decomposed with precipitation of a Subsulphate of Copper. Many of the characteristics of the Sulphate of Copper are displayed by this preparation; and the solution of Arsenious acid renders it of a green colour, from combining with the Oxide of Copper, and forming the green insoluble Arsenite of Copper.

Prep. L. Rub together *Sulph. Copper* ℥j. and *Sesquicarb. Ammonia* ℥ i ß. till Carb′ is no longer evolved. Wrap the mass in bibulous paper and dry it in the air. E. D. Same proportions.

On rubbing together the Sulph. Copper and Sesquicarb. Ammonia, effervescence ensues, from the escape of a great portion of the Carb′, and the mixture becomes of a deep blue colour, and moist from the water of crystallization of the salts. There is some difference of opinion about the chemical nature of this substance, but it is most probable that it consists of a double salt called Cupro-sulphate of Ammonia ($N\,H_3, Cu\,O + N\,H_3, S\,O_3, H\,O = 123$) with some excess of Sesquicarb. Ammonia, and occasionally a little Subsulphate of Copper. In the above salt, (which may be obtained in crystals by mixing solutions of the Sulphate and Sesquicarbonate in the atomic proportions, and evaporating), the Oxide of Copper acts the part of an acid. It seems that in the formation of this substance, 1 equivalent of each of the mixed salts is required. 1 Eq. of Sesquicarb. Ammonia contains 2 of Ammonia and 3 of Carb′. All the $C\,O_2$ escapes. The Sulph. Copper being decomposed, Cu O unites with 1 Eq. of Ammonia, and the $S\,O_3$ with the other Eq., forming a Cuprate and a Sulphate. These together constitute the Cupro-sulphate.

$$Cu\,O, S\,O_3, 5\,Aq. + 2\,N\,H_3, 3\,C\,O_2, 2\,Aq. = (Cu\,O, N\,H_3 + N\,H_3, S\,O_3, H\,O) + 3\,C\,O_2 + 6\,Aq.$$

Tests. By heat it is converted into Oxide of Copper, evolving Ammonia. Dissolved in water, it changes the colour of Turmeric, and solution of Arsenious acid renders it of a green colour. L. P.

Inc. Acids, Potash and Soda, Lime-water.

Action. Uses. Irritant, Astringent, Tonic, Antispasmodic, Emetic.

D. gr. ¼—gr. v. gradually increased.

Liquor Cupri Ammonio-Sulphatis, L. Cupri Ammoniati Solutio, E.

Prep. L. E. Dissolve *Ammonio-Sulphate of Copper* ʒj. in *Aq. dest.* Oj. Filter.

This solution is of a fine blue colour; but Mr. Phillips remarks,

that unless the Ammonio-Sulphate of Copper retain some excess of Sesquicarbonate of Ammonia, the salt is decomposed, and one half of the Oxide of Copper is precipitated.

PILULÆ CUPRI AMMONIATI, E.

Prep. Take *Ammoniated Copper* finely powdered 1 part, *Bread-crumb* 6 parts, *Solution of Carbonate of Ammonia* q. s. Beat into a proper mass and divide into pills, each to contain ½ a grain of Ammoniated Copper, of which one may be taken two or three times daily, and the dose gradually increased.

ÆRUGO. (CUPRI DIACETAS IMPURA.) L. E. Cupri Subacetas, D.

Verdigris. Commercial Diacetate of Copper. *F.* Vert de gris. Acetate basique de Cuivre. *G.* Grünspan.

Ærugo or Verdigris must have been early known, from the employment of Copper vessels, as well as of Vinegar and sour Wines. It was in fact employed by the Greeks as a medicine, also by the Arabs, and probably by the Egyptians. There is little doubt, however, that the term Ærugo, as well as the χαλκοῦ ἰός, included the Carbonate as well as this Acetate of Copper.

Prop. Verdigris is sold either in powder or in amorphous masses, of a pale bluish-green or of a bright blue colour, with an odour of Vinegar, and a disagreeable Coppery taste. It remains unchanged in the air; but when heated, water is first expelled, and then Acetic′, Oxide of Copper being left, with some metallic Copper. Verdigris is insoluble in Alcohol; and decomposed by water, being resolved into an Acetate which dissolves, and a dark-green insoluble powder, which afterwards becomes black, and is a Subacetate or a Tribasic Acetate of Copper. Sul′ decomposes it with effervescence. There are several compounds of Acetic′ and Copper, but the bluish-coloured Verdigris (Acetate de Cuivre bi-basique) is the only one employed in medicine. The composition of this has been shown by Mr. R. Phillips to be 2 Eq. of Copper combined with 1 of Acet. Acid and 6 of water; that is, a Hydrated Diacetate, ($2\ Cu\ O + \overline{Ac} + 6\ Aq. = 185$). But Verdigris, when of a green colour, contains the Subsesquiacetate and the Trisacetate. 2 Eq. of the officinal Diacetate are equivalent to 1 Eq. of neutral Acetate (soluble in water); and 1 of Trisacetate (insoluble), and are resolved into these by the agency of water.

$$2\ (2\ Cu\ O,\ \overline{Ac}) = Cu\ O,\ \overline{Ac} + 3\ Cu\ O,\ \overline{Ac}.$$

Prep. Verdigris may be made by acting on plates of Copper with Vinegar or with Ac′. Under the influence of air the Copper becomes oxidized, combines with the acid, and is scraped off as formed. In the South of France sheets of Copper are stratified with the refuse of the grape left after making wine, and allowed to remain for a month or six weeks. Acetous fermentation takes place, and the Copper becomes coated with Verdigris, which is scraped off, and the operation repeated. The different scrapings form a paste, which is well beaten with wooden mallets, then packed in leathern bags.

Tests. Almost entirely soluble in Dil. Sul′ with the aid of heat;

partially soluble in water. From this solution nothing is precipitated by Ammonia added in excess, (Cu O being soluble in it). L. It is dissolved in a great measure by Mur′, not above five per cent. of impurity being left. The Sul′ forms a blue and the Mur′ a green solution.

Inc. Strong Acids, Alkalis, and their Carbonates.

Action. Uses. Detergent, Escharotic, Tonic, Emetic.

D. Usually applied externally only. Dose internally, gr. ß.

Cupri Sub-Acetas præparatum, D. Prepared Verdigris.

Prep. Triturate the *Sub-Acet. Copper* into powder and separate the finest parts by means of a sieve.

Used only as an Escharotic and Stimulant.

Linimentum Æruginis, L. *Mel Ægyptiacum. Unguentum Ægyptiacum.*

Prep. Dissolve powdered *Verdigris* ℥j. in *Vinegar* f℥vij. Strain through linen. Add *Clarified Honey* ℥xiv. Boil to a proper consistence.

Action, Uses. Stimulant and slightly Escharotic. Applied with a camel's hair brush to ulcers; or, diluted, employed as a gargle.

Unguentum Æruginis, E. Unguentum Cupri Subacetatis, D.

Prep. E. Melt *Resinous Ointment* ℥xv., sprinkle into it finely powdered *Verdigris* ℥j. Stir the mixture briskly as it cools and concretes. D. Similar, ointment of White Wax being used.

Similar in its nature and uses to the preceding, especially as an application to foul ulcers.

Plumbum, E.

Lead. Saturn of the Alchemists. *F.* Plomb. *G.* Blei.

Lead (Pb=104) is one of the most anciently known of the metals. It is found chiefly as Sulphuret or Galena, but occurs in a metallic state, as an oxide, and combined with several acids.

Prop. Lead is of a bluish-grey colour; fresh cut, is of great brilliancy, but soon tarnishes; has a slight taste, and a peculiar smell when rubbed; is soft, marks paper; has little tenacity, but may be beaten into thin sheets. Sp. Gr. 11·435. It melts at 612°, and boils at a red heat: on solidifying, it contracts, and may be crystallized in octohedrons. Exposed to the air, the surface becomes covered with a greyish pellicle. It may be preserved unchanged under perfectly pure water; but if any air be present, the Lead becomes oxidated, and some of it combining with the Carb′, white Carb. Lead with Hydrated Oxide is formed. This change also readily takes place when rain or any other equally pure water is exposed to the action of air in Leaden cisterns or pipes. The vessels become coated with a white incrustation of a pearly lustre, and some of the fine crystals may be seen floating on the water, part of which being (dissolved or) suspended, it becomes poisonous. Dr. Christison ascertained that the opinion of G. Morveau

was correct, that the presence of any neutral salts, especially of Sulph. and Carb. of Lime, which are usually present in spring or river water, or a minute trace of Sul′ or Phosp′, prevents the continued corrosion of the Lead. The Oxide and Carb. being allowed to be deposited and to adhere with firmness to the Lead, and the other insoluble salts, such as Sulph., Phosph., and Carb. Lead, becoming added, protect the Lead with an impenetrable coating, instead of its being carried away by the water. The late Prof. Daniell ascertained that when water contains free Carb′, Lead is readily dissolved, and water cannot therefore be safely kept in or transmitted through that metal.* So that in perfectly pure water lead is not affected; in rain or river-water, which is comparatively pure, but contains Carb′, it is acted upon, and the Carbonate formed held in solution by more $C\,O_2$; and in common water containing saline matters, it is acted upon, but protected by the precipitation of insoluble matters. Though at ordinary temperatures Lead is little liable to oxidate, in a state of very fine subdivision it will take fire when exposed to the air. It is also readily oxidated and dissolved by Nit′. (*v.* Acet. and Nitr. Lead for the effect of reagents.) It unites with Oxygen in several proportions, also with Sulphur, Phosphorus, Iodine, and Chlorine; likewise with numerous metals, and, in the state of Protoxide, forms with the acids and fatty substances various compounds. Zinc separates it from any of its solutions. Lead is obtained very pure, for chemical purposes, from the Nitrate; but, on the large scale almost entirely from the Sulphuret, or Galena, by the process of roasting, when Sulphate and Oxide of Lead are formed. To these Lime and Carbonaceous matter are added, the former for the purpose of decomposing the Sulph. Lead, and the other to unite with the Oxygen of the Oxide of Lead, and thus both the Oxide and Sulphate are reduced to a metallic state.

Tests. Lead is usually sufficiently pure for Pharmaceutical purposes, but often contains Iron or Copper. These may be detected by dissolving it in dilute N′, and precipitating with a little excess of Sul′. On the addition of Ammonia to the filtered solution, it will become of a violet, if Copper, and of a yellow colour if Iron be present. If a plate of Zinc be introduced into a solution of Lead, this metal will be deposited in an arborescent form. Alkalis, combining with the acid of its salts, throw down the Hydrated Oxide; Sul′ and its salts, a white insol. Sulphate; Chromate of Potash, a yellow Chromate; Hydrosul′ and its salts, a black Sulphuret; Iodide of Potassium a yellow Iodide, and the Ferrocyanide of Potassium a white Ferrocyanide of Lead.

* Water which contains less than 8000th of salts (such as Carbs. and Sulphs.) in solution (a 4000th or even a larger proportion of Muriates is insufficient) cannot be safely conducted in Leaden pipes without certain precautions. A remedy may be found either in leaving the pipes full of water and at rest for 3 or 4 months, or by substituting for the water a weak sol. of Phosph. Soda in the proportion of about a 25,000th part. Christison. Edin. Phil. Trans. xv. Part ii.; Pharm Journ. ii. 335; R. Phillips, Junr. P. J. iv. 304.

Oxides of Lead.

There are several Oxides of this metal. 1. The Suboxide or Dioxide of a dark grey colour, supposed by Berzelius to form the pellicle which covers Lead that has been exposed. 2. Protoxide, of a yellow colour, commonly called *Massicot*, and of which Litharge and the Plumbi Oxydum Hydratum are two officinal forms. 3. Red Oxide, sometimes called Peroxide, Red Lead, and Minium, Plumbi Oxydum Rubrum, E., supposed by some to be a compound of the 2nd and 4th; and 4. a Brown, Bin-, or Peroxide.

Plumbi Oxidum (*Semivitreum*), L. D. Lithargyrum, E.

Oxide of Lead, fused. Litharge. *F.* Protoxide de Plomb. *G.* Bleioxyd.

This Oxide of Lead ($Pb\,O=112$) was known to the ancients, being easily produced when melted Lead continues to be exposed to a current of heated air. The surface of the metal becomes rapidly covered with a scaly powder of a Sulphur-yellow colour, which is the Protoxide of Lead, and which, being skimmed off, is known in commerce by the name of *Massicot.* When the heat is continued to a bright red, some metallic Lead is separated, the Oxide is fused, though imperfectly, and, on cooling, becomes an aggregated mass, which readily separates into crystalline scales, of a greyish-red colour. These form the *Litharge* of commerce, which varies in colour, and is called *Gold Litharge* when of a red colour, owing to the presence of a little *Red Lead*, but *Silver Litharge* when lighter coloured. These are frequently obtained in the process of refining Gold and Silver by means of Lead, and in separating the Silver from Argentiferous Lead.

Prop. Litharge is nearly insoluble in water; tasteless; Sp. Gr. 9·42. It may be melted into a glass, but is readily reduced to a metallic state if Carbon be present. It is remarkable for its power of depriving many vegetable substances of colour. It is readily dissolved in diluted Nit′ or Acet′, as also in some other acids, and absorbs Carb′ from the atmosphere. Comp. $Pb\ 92{\cdot}85+O\ 7{\cdot}14=99{\cdot}99$.

Tests. The Litharge of commerce is liable to contain a little Iron, also Copper, Carb. Lead, Silica, and other earths. Almost entirely soluble in dil. Nit′. This solution becomes black on adding H S. Potash throws down a white precipitate, which is redissolved by the same in excess. If Sulphate of Soda be added to 100 grains of this oxide, dissolved in dil. Nit. Acid, 135 grains of Sulphate of Lead are precipitated. L. P. 50 grs. dissolve entirely, without effervescence, in Pyroligneous acid f℥j.ß; and the solution, precipitated by 53 grs. of Phosph. Soda, remains precipitable by more of the test. E. P. If the

whole is soluble in Nit′, it proves that neither Sulph. Baryta nor Sulph. Lead is present; and the want of effervescence, that there is no Carb. Lead. Copper and Iron will be detected by their respective tests.

Action. Uses. Litharge, like the other preparations of Lead, will affect those exposed to its influence; but it is only employed Pharmaceutically, as for making Diacetate of Lead, and by combining with oil to form the Lead Plaster, which is the basis of several other Plasters.

EMPLASTRUM PLUMBI, L. Emplastrum Lithargyri, E. D. Litharge or Lead Plaster. Diachylon Plaster.

Prep. L. Mix *Oxide of Lead* rubbed to very fine powder ℔vj., *Olive Oil* Cj. *Aq.* Oij. boil over a slow fire stirring constantly till the oil and oxide unite into the consistence of a plaster. Add a little boiling water, if that used at the beginning evaporate too much. E. D. Similar.

The oil consists of 2 acids, Oleic and Margaric, each combined with a base, Glycerine. The Oxide of Lead displaces the latter, forming 2 soaps, or fatty salts, Oleate and Margarate of Lead. These united make the plaster, insoluble in water. The Glycerine is soluble in water, and removed by its agency.

Action. Uses. Forms excellent strapping from its mildness, and is useful in surgical cases in keeping together the lips of wounds.

Off. Prep. Emp. Galbani, L. Emp. Hydrargyri, L. Emp. Opii. Emp. Saponis.

EMPLASTRUM RESINÆ, L. Emp. Resinosum, E. Emp. Adhæsivum. Resin Plaster, Adhesive or Sticking Plaster. Basilicon Plaster.

Prep. L. Take *Lead Plaster* ℔iij., *Resin* ℔ß. Melt the Plaster of Lead with a gentle heat, add the Resin, also melted, and mix. E. D. Similar. D. C. orders some soap.

Action. Uses. This plaster, serving the same purposes as the Lead plaster, is more frequently employed on account of being more adhesive; but is objectionable in some cases, in consequence of being more irritant to the skin. It is used as strapping to give support to Ulcers, buboes, &c.

UNGUENTUM PLUMBI COMPOSITUM, L. Comp. Ointment of Lead.

Prep. Melt over a slow fire *Plaster of Lead* ℔iij. in *Olive Oil* f℥xviij.; then mix *Prepared Chalk* ℥vj., and then *Distilled Vinegar* f℥vj., stirring constantly till cold.

Action. Uses. The Acet. Lime is mixed with Lead Plaster, and a mild Ointment produced, which is used as a dressing to ulcers.

In the P. L. of 1836, *Plumbi Oxidum Hydratum* was ordered to be used in the preparation of Disulphate of Quinine; and *Plumbi*

Chloridum, in that of Hydrochlorate of Morphia. They are now both omitted, no formula being prescribed for the preparation of the two vegetable salts.

PLUMBI OXIDUM RUBRUM, E.

Red Oxide of Lead. Red Lead. Minium. *F.* Oxide rouge de Plomb. *G.* Mennig Rothes Bleioxyd.

Red Lead or Minium, as this Oxide is called, was known to the Arabs and is the Suranj of Avicenna, commonly translated Cinnabar. It is prepared by the Hindoos, and is their *Sundoor.* Dioscorides (lib. v. c. 109) knew that Minium was distinct from Cinnabar. It is sometimes called Binoxide, also Deutoxide of Lead.

Prop. Red Oxide of Lead ($Pb_3\ O_4 = 344$), or Minium, forms a powder in scales of a bright red colour; tasteless, heavy (Sp. Gr. about 9), and insoluble in water. When heated, it melts, then gives out Oxygen, and becomes converted into the Protoxide. If placed on Charcoal, it is reduced, with the flame of the blowpipe, to a globule of Lead. Completely dissolved " in highly fuming Nitrous acid," E. Protonitrate of Lead is formed, as the $N\,O_4$, by uniting with the excess of Oxygen, is converted into Nit′. It is only " partially soluble in dilute Nit′," being converted into two Oxides, a brown-coloured Peroxide, which is left, and a Protoxide which is dissolved. The composition of the Red Oxide has not been definitively settled; indeed, the Red Lead of commerce is considered to be variable in composition. But 2 Eq. of Protoxide with 1 of the Binoxide, may be considered one of the most common proportions.

Prep. Obtained by exposing Massicot or the Protoxide to air and heat below, what is required for fusion, when the quantity of Oxygen required is absorbed, and the yellow Protoxide converted into bright red coloured Minium.

Tests. Red Lead is not very liable to adulteration, but brick-dust or red-bole (insoluble in Nitrous acid) is sometimes mixed with it; also Red Oxide of Iron, which may be detected by testing the solution in Nitric acid with Tincture of Galls.

Action. Uses. Red Lead might be employed for the same purposes as the Protoxide. It is officinal in the E. P. for purifying concentrated Acetic acid, and for making Aqua Chlorinii.

PLUMBI IODIDUM, L. E. D.

Iodide of Lead. *F.* Iodure de Plomb. *G.* Iod-Blei.

Iodide of Lead ($Pb\,I = 230$) has only recently been discovered and introduced into medicine. It may be formed by the direct action of Iodide on Lead, or as below. It is usually seen in the form of a fine yellow powder, which is without taste or smell, insoluble in cold

but readily dissolved in boiling water, forming a colourless solution. But as this cools, it becomes deposited in brilliant scale-like crystals of a golden-yellow colour, in which form it is also sold, and is then very pure. It is first melted and then decomposed by heat, the Iodine being dissipated in violet-coloured vapours. It is soluble in Acet′ and Alcohol, also in solution of Potash. Comp. Pb 45·22 +I 54·78=100.

Prep. L. Dissolve *Acet. Lead* ℥viij. in *Aq. dest.* Ovj., and *Iodide Potassium* ℥vij. in *Aq dest.* Oij. Mix the solutions. Wash the precipitate. Dry it. Let it be kept from the light.

E. D. Both of these use *Nitrate of Lead,* and *Iodide of Potassium,* of each ℔j. The E. C. purify the product by solution in boiling dilute Pyroligneous Acid, from which it crystallizes on cooling.

By mutual decomposition, Iodide of Lead is formed and precipitated, while the Oxygen of the Oxide of Lead in the Acet. being transferred to the Potassium, Potash is formed, which, uniting with the acid, forms a soluble Acetate of Potash. Nitr. Lead is preferred in the E. P., because an excess of the Oxide of Lead is apt to exist in the Acetate, which is injurious because disposed to form compounds with the Iodide. The process of boiling in Pyroligneous acid and subsequent crystallization gets rid of any Oxide or Carb. of Lead. The same effect may be obtained by adding a little Acet′ to the solution of the Acet. Lead previous to pouring it into the solution of the Iodide of Potassium.

Tests. Totally dissolved by boiling water, and as this cools, separating in shining yellow scales. It melts by heat, and the greater part is dissipated, first in yellow (Iodide of Lead), and afterwards in violet vapours. If 100 grs. of Iodide of Lead be dissolved in Nitric′ diluted with twice its weight of boiling water, and after the Iodine is expelled, Sulphate of Soda be added, 66 grs. of Sulphate of Lead are thrown down. L. P. 5 grs. are entirely soluble, with the aid of ebullition, in f℈j. of Pyroligneous acid diluted with a f℥j.ß of distilled water, and golden crystals are abundantly deposited on cooling. E. P.

Action. Uses. Deobstruent, generally used externally, but sometimes internally.

D. gr. ¼ to gr. ij.

Unguentum Plumbi Iodidi, L. D.

Prep. L. Mix well together *Iodide of Lead* ℥j. and *Lard* ℥viij. D. Similar, *ointment of White Wax* being used.

Discutient in chronic enlargements of the joints and in scrofulous tumours.

Plumbi Carbonas, E. D.

Carbonate of Lead. *Subcarbonate of Lead. Cerussa. White Lead.* *F.* Carbonate de Plomb. *G.* Kohlensaures Bleioxyd. Bleiweiss.

Carbonate of Lead ($Pb\ O, C\ O_2 = 134$) is one of the most anciently known of the metallic salts. It is found as a mineral in many Lead districts, and known as Cerusse and White Lead ore.

Prop. Carb. Lead is white, tasteless, and heavy; either in powder or in white amorphous masses. When found in nature, its crystals vary much in form from the right rhombic prism from which they proceed. Sp. Gr. about 6·25. It is insoluble in water. Heated, the Carb′ escapes, and the yellow Protoxide of Lead is left; on Charcoal and before the blowpipe, it is reduced to a globule of metallic Lead. It is soluble with effervescence both in the Acetic and the Nitric acids. Acetate and Nitrate of Lead being the result, will be effected by reagents like other preparations of Lead Comp. Pb O 83·5+ C′ 16·5=100.

Carbonate of Lead may be prepared by the action of air and pure water on metallic Lead, or by passing a current of Carb′ gas through a solution of Diacet. Lead. The most ancient method, and that which makes the best White Lead for the use of painters, is by exposing sheets of Lead to the fumes of Vinegar or of strong Acet′. The latter is placed in an earthen vessel, and the former a little above it, either rolled spirally or cast into bars. The pots are arranged side by side, and imbedded in a mixture of new and spent tan (ground oak bark). The tan gradually heats or ferments, and begins to exhale vapour, the temperature of the inner parts of the stack rising to 140° or 150°, or even higher. The Acet′ is slowly volatilized, and its vapour passing readily through the gratings or folds of Lead, gradually corrodes the surface of the metal, upon which a crust of Subacetate is formed, but is decomposed by the rising vapours, and converted into Carbonate of Lead, there being an abundant supply of Carb′ furnished by the slow fermentative decomposition of the tanner's bark. The White Lead, crushed and broken up, is transferred to mills, where it is ground up into a thin paste with water, washed, and dried.

Test. Dissolved with effervescence in dil. Nit′. What is precipitated from the solution by Potash is white, and is redissolved by excess of it: it becomes black on the addition of Hydrosul′. It becomes yellow by heat, and when heated with Charcoal, is reduced to metallic Lead. It does not lose weight at a temperature of 212°. 68 grs. are entirely dissolved in 150 minims of Acet′ dil. with Aq. dest. f℥j.; and the solution is not entirely precipitated by a solution of 60 grs. of Phosph. Soda. (E. P.) Dr. C. states that 60 grs. of this Phosphate exactly decompose 67·05 grs. of pure Carb. Lead. Hence with 68 grs. of the Carb., as in the formula, some Lead must remain

in solution if the Carb. be pure, and will be shown on adding more Phosphate to the filtered liquor. But if any of the ordinary adulterations be present there will be an excess, not of Lead, but of Phosphate of Soda in solution. Sulph. Baryta is often mixed with it; it is insoluble in Nitric acid.

Action. Uses. Desiccative and Astringent. Applied only externally, as by dusting on excoriations. Dr. A. T. Thomson considers it the only poisonous salt of Lead, the others becoming so by being first converted into Carbonate of Lead.

Unguentum Plumbi Carbonatis, E. D.

Prep. E. Mix thoroughly *Simple Ointment* ℥v. and *Carb. Lead* ℥j. D. Similar, *White Wax ointment* being used.

Action. Uses. A cooling and drying application to excoriations and burns, also to ulcers and eruptions attended with irritation.

Plumbi Nitras, E. D.

Nitrate of Lead. *F.* Nitrate de Plomb. *G.* Salpetersaures Bleioxyd.

Prop. Nit. Lead ($Pb\,O, N\,O_5 = 166$) crystallizes in octohedral and tetrahedral crystals; and is soluble in about 4 parts of water. It increases the combustion of burning fuel when thrown upon it, and is reduced to the state of metallic Lead. Heated, it evolves the fumes of Nitrous gas; Oxide of Lead being left.

Prep. E. With the aid of gentle heat saturate *dilute Nitric'* Oj. with *Litharge* ℥ivß. Filter and set aside to crystallize. Concentrate the remaining liquor to obtain more crystals. D. Similar.

Action. Uses. It will act as the other preparations of Lead, but is officinal in the E. and D. P. for making Iodide of Lead. (It is contained in M. Ledoyen's *Disinfecting Solution.*)

Plumbi Acetas, L. E. D.

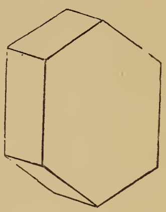
Acetate of Lead. *Plumbi Superacetas. Saccharum Saturni. Sugar of Lead.* *F.* Acetate acide de Plomb. *G.* Bleizucker.

Acet. Lead ($Pb\,O, C_4\,H_3\,O_3, 3\,H\,O = 190$) seems to have been known at least since the cultivation of chemistry in the middle ages.

Prop. It is of a white colour, and of a sweet astringent taste, with a smell of Vinegar. The crystals form brilliant needles, or small tetrahedral prisms terminated by dihedral summits, and usually occur in an agglomerated mass; unalterable in the air, except when it is very dry, when they slightly effloresce; soluble in 4 parts of water and in Alcohol. The watery solution is capable of dissolving a por-

tion of Oxide of Lead, which converts it into a Diacetate of that metal. Heated, the crystals fuse in their water of crystallization, which at a higher temperature is dissipated; the white mass which remains again melts, Acetic and Pyroacetic acids are given off, and a globule of Lead may finally be obtained. The Acet. may be partially decomposed by the Carb′ of the atmosphere, also by that contained in water; hence the hazy appearance when it is dissolved in it, and which may be removed by the addition of a little Acet′. It is decomposed by a number of acids, the Sulph′ causing the exhalation of the odour of Vinegar, also by the alkalis, numerous salts, infusion of Galls, most Vegetable principles, also Milk and Albumen. Comp. Pb O 58·9 + Ac′ 26·8 + Aq. 14·3 = 100.

Fig. 28.



Prep. E. Mix *Pyroligneous′* Oij. with *Aq. dest.* Oj. add to it *Litharge* ℥xiv. Dissolve with the aid of a gentle heat. Strain; evaporate for crystallization on cooling.

The L. and D. Coll. place the salt in the list of Mat. Med.

It is frequently prepared, as above, by dissolving Litharge in Pyroligneous acid; or by exposing Lead, half immersed in Acet′, to heat and air. The Lead being oxidized or converted into the Carbonate, will, on falling into the Acet′, be formed into Acetate.

Tests. Dissolved by distilled water. By Carb. Soda a white precipitate (Carb. Lead) is thrown down from the solution, and by Iodide of Potassium a yellow one (Iodide of Lead); by Hydrosul′ it is blackened (Sulphuret Lead being formed). Sulph′ evolves Acetic vapours. By heat it first fuses, and is afterwards reduced to metallic Lead. If 100 grains are dissolved in water, and Sulphate of Soda be added, 80 grains of Sulphate of Lead are precipitated. (These simple quantitative tests afford in general a very decided evidence of purity.) L. P. 48 grs. in solution are not entirely precipitated by a solution of 30 grs. of Phosph. Soda. (E. P.) As 30 grs. of the latter salt will just decompose 47·66 grs. of Acet. Lead, if 48 grs. or a 144th part more of the latter be used, the solution will be affected, after filtration, by a further addition of Phosphate, provided the Acetate be tolerably pure.

Inc. Sulph′, H Cl, Carb′, Cit′, and Tart′; Lime-water, Potash and Soda; Hard Water from the salts, and Liq. Ammoniæ Acet. from the Carb′ contained in it.

Action. Uses. Irritant Poison; Astringent and Sedative in profuse discharges and Hæmorrhages. Lotion; ʒj.—℥v. or ℥viij. of fluid. Externally as an Astringent Collyrium and Wash.

D. gr. j. and ij.—gr. x. 2 or 3 times a day, especially with dilute Acet′ or distilled Vinegar.

Antidotes. Evacuate the stomach with Sulph. Zinc and warm diluents; give Sulph. Soda and of Magnesia, and Phosphate of Soda, to render the Lead insoluble.

CERATUM PLUMBI ACETATIS, L. Cerate of Sugar of Lead.

Prep. Mix *Bees Wax,* melted, ʒv. with *Olive Oil* f℥xviij,, and add gradually powdered *Acetate of Lead* ʒv., first separately triturated with ℥ij. more of *Oil.* Stir with a spatula until they unite.

Use. As a cooling application to burns, blisters, and irritable sores.

UNGUENTUM PLUMBI ACETATIS, E. D. *Unguentum Saturninum.* Ointment of Sugar of Lead.

Prep. E. Mix thoroughly *Simple Ointment* ℥xx, finely powdered *Acet. Lead* ʒj. D. Similar: *White Wax ointment* being used.

Uses. Same as the last.

PILULÆ PLUMBI OPIATÆ, E. Acetate of Lead and Opium Pills.

Prep. Take *Acet. Lead* 6 parts, *Opium* 1 part, *Conserve of Red Roses* 1 part, beat into a proper mass and divide into 4 grain pills. They may also be made with twice as much Opium. Each pill contains 3 gr. Acet. Lead and ½ gr. of Opium.

In this pill chemical changes take place, Acetate of Morphia and Meconate of Lead being formed; but the pill has been so long employed, and its therapeutical value so fully confirmed, that the change would seem to be rather an advantage than a detriment. The E. C. do not indicate how the two kinds of Pill are to be distinguished, or how the change, if expressed, will differ from an ordinary prescription.

LIQUOR PLUMBI DIACETATIS, L. D. Solutio, E.

Solution of Diacetate of Lead. *Aqua Lithargyri Acetati. F.* Sous-acetate de Plomb. *G.* Halb-Essigsaures Bleioxyd.

Diacet. Lead ($2\,Pb\,O, C_4\,H_3\,O_3 + 10\,Aq. = 365$) in the form of solution commonly called *Goulard's Extract,* was by Goulard himself called *Extract of Saturn,* that is, of Lead. It seems to have been known since the time of B. Valentine, and owes its formation to the solution of Acetate of Lead dissolving a further proportion of the Oxide, and thus becoming converted into solution of the Diacetate of Lead.

Prep. L. Boil *Acet. Lead* ℔ij. and ℥iij., and powdered *Oxide of Lead* ℔j. and ℥iv. in *Aq. dest.* Ovj., frequently stirring for half an hour. When cold add distilled water to make up Ovj. Filter. E. Similar.

D. Similar: but the solution is weaker. The Sp. Gr. of the L. prep. is 1·260, of the D. 1·066.

Prop. Colourless, with a sweetish and sub-astringent taste, having an alkaline reaction on test-paper. By careful evaporation out of access of air, crystals may be obtained of a tabular form, or the salt in an uncrystallizable mass (dry Extract of Saturn, of Goulard). When exposed to the atmosphere, some Carb′ is absorbed and white Carb. of Lead is deposited; also on passing Carb′ gas into its solution, and this is one of the methods adopted in making Carb. Lead, q. v. It is decomposed by common water. It precipitates mucilage and most vegetable colours.

Tests. Sp. Gr. 1·260. L. A copious precipitate is gradually formed when the breath is propelled through it by means of a tube. E. The other properties are those of the Acet. Lead. When prepared with inferior Vinegar it is of a brown colour.

Inc. Acids, Alkalis, Earths, Alum, Borax, Tartarized Iron and Antimony, Soap, Hard and Spring-water, Sulphuretted Hydrogen, Mucilaginous solutions and drinks.

Action. Uses. Astringent and Sedative. *Externally*, diluted with water; or it may be used in a milder form, in the following preparation.

LIQUOR PLUMBI DIACETATIS DILUTUS, L. Plumbi Subacetatis Liquor Comp., D. Diluted Solution of Diacetate of Lead. Goulard Water.

Prep. L. Mix *Solution of Diacetate of Lead* f℥iß, *Aq. dest.* Oj., *Proof Spirit* f℥ij. D. This dilute solution of the D. P. is about twice as strong as that of the L. P.

Useful as a soothing, astringent, and sedative Collyrium or lotion.

CERATUM PLUMBI COMPOSITUM, L. Compound Cerate of Lead. *Goulard's Cerate. Ceratum Lithargyri Acetati.*

Prep. Melt *Wax* ℥viij. and mix with it *Olive Oil* f℥xvj.; remove from the fire, and when first the mixture begins to thicken, add gradually *Sol. of Diacet. Lead* f℥vj., stirring constantly with a spatula till cool. Then mix with these *Camphor* ʒj. dissolved in *Olive Oil* f℥iv.

Action. Uses. This is commonly called Goulard's Cerate, and is a soothing, astringent, and sedative application for irritable surfaces and in chronic Ophthalmia.

BISMUTHUM, L. E. D.

Bismuth. *F.* Bismuth. *G.* Wismuth.

Bismuth (Bi=213) is first mentioned by Agricola in 1520, having previously been confounded with Lead. It is usually met with in its metallic state, but also as an Oxide and a Sulphuret.

Prop. Bismuth is of a reddish-white colour, devoid of taste or smell. It is brittle, of a lamellar structure, and readily crystallizes

in cubes or octohedra. Sp. Gr. 9·53—9·88. It melts at 497° Far. or 507° (Gr.), and volatilizes at a full red heat. When exposed to the air, it tarnishes, but does not oxidate: at a high temperature, it burns with a pale blue flame, when Teroxide of Bismuth ($Bi\,O_3=237$) is formed, and escapes in white fumes. Bismuth is with difficulty acted on by H Cl or by dil. Sul′, but readily by Nit′., *v.* infra.

Tests. Sp. Gr. 9·8. It is dissolved by Nit′ with the aid of heat; the solution is colourless; when Nitrate of Bismuth is precipitated from this solution by Ammonia, the liquor remains free from colour. It also deposits a white powder when much diluted with water. Bismuth is employed only for making the following preparation:

BISMUTHI NITRAS, L. Bismuthi Subnitras, D. Bismuthum Album, E. *Magistery of Bismuth.* Trisnitrate of Bismuth. *F.* Sous-nitrate de Bismuth. *G.* Wissmuth weiss.

The Nitrate of Teroxide of Bismuth ($Bi\,O_3$, $N\,O_5$, $H\,O=300$), is a tasteless powder of a brilliant white colour, and consists of microscopic needle-shaped crystals.

Prep. L. Mix *Nitric′* f℥j ß. with *Dist. Water* f℥j., and *Bismuth* ℥j. being added, apply heat until it is dissolved. Pour the solutions into *Dist. Water* Oiij., and strain the mixture through linen, so that the powder may be separated. Wash this with distilled water, and dry it at a gentle heat. E. D. Similar.

In this process three different Nitrates of the Teroxide of Bismuth are concerned. These are, the officinal Nitrate, nearly insol. in water, containing 1 Eq. of acid to 1 of Teroxide; the Ternitrate, containing 3 Eq. of acid to 1 of Teroxide, decomposed by water into the first and third; and the Supernitrate, soluble in water, containing 9 Eq. of acid to 1 of Teroxide.

By the action of the strong acid the Ternitrate is first formed, 1 Eq. of Nitric′ yielding 3 Eq. of Oxygen to the Bismuth, so that Binoxide of Nitrogen escapes.

$$Bi+4\,N\,O_5=Bi\,O_3,\ 3\,N\,O_5+N\,O_2.$$

This salt, on being thrown into a large quantity of water, becomes decomposed into the insoluble Nitrate, which precipitates, and the soluble Supernitrate, which remains in solution.

4 Eq. of the Ternitrate produce 3 Eq. of the former, and one of the latter salt. Thus,

$$4\,(BiO_3,\ 3\,NO_5)+3\,HO=3\,(Bi\,O_3,\ NO_5,\ HO)+BiO_3,\ 9\,NO_5.$$

Tests. It is soluble in Nit′ without effervescence; solution colourless. Dil. Sul′ being added to the solution, nothing is thrown down. L. E. The first indicates that no Carbonate is present, and the second the absence of Lead.

Action. Uses. Irritant, Tonic, Antispasmodic.

D. gr. v.—℈j.

Stannum, E. D.

Tin. *F.* Etain. *G.* Zinn.

Tin (Sn=59) is one of the most ancient known of the metals, being mentioned by Moses under the name Bedel. It was used by the Egyptians, probably obtained from the East by the trade with India. The Greeks and Romans obtained it through the Phœnicians from England. It abounds in Cornwall, and in the East from Mergui to the island of Banca. It occurs both as an Oxide and as a Sulphuret, but chiefly the former, which is easily reduced to a metallic state by being heated with Charcoal, which abstracts its Oxygen. It is brought into commerce in the form of Grain Tin and Block Tin. Malacca Tin and Banca Tin are the Eastern varieties; to these Mergui Tin has lately been added.

Prop. In mass, bluish-white, tarnishing but slightly, of a peculiar odour when rubbed; so malleable, as to allow of being beaten into *sheet tin* and *tin-foil;* soft, fusible; Sp. Gr. 7·29; that of commercial specimens is often higher, from the impurities which they contain. It fuses at 442°, and then becomes covered with a grey crust of the Oxide; burns at a red, and is volatilized at a white heat.

Tests. Tin, boiled with H Cl, is almost entirely dissolved, a Protochloride being produced; the solution is colourless, but becomes purple on the addition of Chloride of Gold: the precipitate by Potash is white; when this is added in excess, the precipitate is redissolved. Hydrosulphuric acid gives a brown precipitate. Commercial Nit′ f℥iij. converts 100 grs. entirely into white powder; pure Oxide of Tin is formed, with much disengagement of Nitrogen; distilled water, boiled with this powder and filtered, yields no precipitate with solution of Sulph. Magnesia, E. P. (This is to ascertain the absence of Lead.)

The tests which characterize Tin will show its true nature. The gold test is the most characteristic.

Pulvis Stanni, E. D. Powder of Tin.

Tin may be employed either in filings, *Limatura stanni*, or preferably as granulated or powdered Tin, the officinal form, for preparing which the E. and D. Pharmacopœias give formulæ. When melted, it is agitated with an iron pestle, a birch broom, or by shaking it in a wooden box having its inside covered with Chalk, and sifting.

Prep. E. Melt Tin in an iron vessel; pour it into a mortar previously heated rather above the fusing point of the metal; triturate briskly as it cools, ceasing as soon as a considerable proportion is finely pulverized; sift the product, and repeat the process with what is left in the sieve.

D. Similar: the product is purified from Oxide by washing with water.

Action. Uses. Mechanical Anthelmintic.

D. ℈iv.—℥j. in treacle or confection.

STANNI PROTOCHLORIDUM, L. Protochloride of Tin.

This may be obtained by dissolving granulated Tin in Hydrochloric Acid with the aid of heat. Hydrogen gas is disengaged, and crystals of the Protochloride of Tin (Sn Cl, H O=104) may be obtained by evaporation.

On the addition of water, this salt is partly decomposed, an Oxychloride being precipitated, and some H Cl being left in solution with the remainder of the Protochloride. The previous addition of some pure H Cl prevents this decomposition. This salt is employed by chemists as a deoxidizing agent. It precipitates Mercury from its solutions. In solutions containing gold it causes a peculiar precipitate of a dark or purplish colour. For this last reason it is contained in the appendix of the L. P. To test the purity of Hydrochloric Acid (q. v.) Gold-leaf is digested in it; if it contain any free Chlorine, part of the Gold will be dissolved by it; the acid will then yield a dark-coloured precipitate on the addition of the Protochloride of Tin.

ANTIMONIUM.

Stibium. Antimony. *F.* Antimoine. *G.* Antimon.

Metallic Antimony (Sb=129) is not officinal; but as so many of its preparations are employed, it is desirable to be acquainted with its characteristics. It was probably known to the Alchemists; but Basil Valentine (*Currus Triumphalis Antimonii*) made known the method of obtaining it. The Tersulphuret, q. v., has been known from the most ancient times. Native Antimony occurs in France and Germany; the other ores are Oxide or White Antimony; Sulphuret, or Grey Antimony; and Sulphuretted Oxide, or Red Antimony. The Sulphuret is the most abundant ore, and that from which the metal is chiefly obtained. The latter used to be called Regulus of Antimony, and the Sulphuret, Crude Antimony. Antimony is obtained by heating the Sulphuret with half its weight of Iron-filings or small Iron nails, when the Sulphur unites with the Iron, and the Antimony is set free. The melted Antimony collects in the bottom of the crucible, and may be run into moulds.

Prop. A bluish-white metal, usually lamellar in structure, and brittle in nature. Sp. Gr. about 6·7. It fuses at a temperature of about 800°, above which it may be volatilized, and in cooling may be made to crystallize in rhombohedra. It undergoes little change in the air, the surface only becoming tarnished and partially oxidized. Heated to a white heat, and suddenly exposed to the air, it burns with a white light; the vapour which escapes condenses in white needle-like crystals of Teroxide of Antimony, which were formerly called *Argentine Flowers of Antimony*. Antimony is dissolved by H Cl with the aid of heat, Hydrogen being disengaged. The solution

of the Terchloride of Antimony, on being added to water, deposits a white precipitate, formerly called *Powder of Algorath*; and an orange-red one of Tersulphuret of Antimony on the addition of Hydrosul′ or an alkaline Hydrosulph. Nit′ converts the metal into Antimonic acid, which is insoluble in the acid. There are three compounds of Antimony and Oxygen: Oxide of Antimony, Antimonious, and Antimonic Acids.

Antimonii Oxidum, E. D.

Antimonii Teroxidum. Teroxide, or Sesquioxide of Antimony. *Flowers of Antimony. F.* Oxyde d'Antimoine. *G.* Antimonoxyd.

Teroxide of Antimony ($Sb\,O_3=153$) occurs native in Bohemia and Hungary, and is called White Antimony. It is produced when Antimony is burnt in the air.

Prop. As prepared below, the Oxide is white and tasteless; unalterable in the air, but becoming yellow by heat, and regaining its colour when cool. By a full red heat it may, like the native Oxide, be fused into a yellow liquid and afterwards sublimed; as before the blowpipe, when needle-like crystals will be deposited. If fused and exposed to the air, more Oxygen is absorbed, and Antimonious acid ($Sb\,O_4=161$) is formed, which is not volatile, less easily fused, and more inert as a medicine. The Teroxide is insoluble in water, but soluble in H Cl, Tart′, and Acet′; also in Bitart. Potash, when Tartar Emetic is formed. Comp. O 15·58+Sb 84·42=100.

Prep. The best mode of obtaining Teroxide of Antimony is that discovered by M. Hornung, and adopted, in a modified form, in the preparation of Tartar Emetic (q.v.) by the L. C.

E. The E. C. prepare it by dissolving the *Tersulphuret of Antimony* (finely powdered) ℥iv. in *Muriatic Acid* Oj. by the aid of a gentle heat. By this a solution of Terchloride of Antimony ($Sb\,Cl_3$) is obtained. The filtered fluid is poured into *Dist. Water* Ov. By this dilution a great part of the Terchloride is decomposed. Cl unites with H of water, forming Hydrochloric acid; and the O of water being set free, unites with the Antimony, forming a Teroxide ($Sb\,O_3$). This, being insoluble, precipitates along with some undecomposed Terchloride, forming with it an Oxichloride, the *white Powder of Algaroth.* This is separated by filtration, and washed free from acid. It is then washed with a weak solution of Carbonate of Soda. This decomposes the Terchloride (forming Na Cl, while $C\,O_2$ escapes), so that now only Teroxide remains. It is dried over a water-bath. (The Subsulphate obtained in the L. formula for Tartar Emetic, may be in the same way decomposed into Oxide by Carb. Soda.)

The D. C. also make the Oxide from a solution of the Terchloride, only using a solution of Potash instead of Carb. Soda.

Tests. Entirely soluble in Mur′, and also in a boiling mixture of water and Bitart. Potash; snow-white; fusible at a full red heat. E. P.

Action. Uses. Emetic, Diaphoretic, Expectorant. A good substitute for Antimonial or James's Powder,

D. gr. iij.—gr. x. in powder or pill. Mr. Tyson gives gr. $\frac{1}{10}$—gr. j.

Pharm. Prep. This Oxide forms the active ingredient in several

officinal preparations, as Pulvis Antimonii Comp., the Oxysulphuret of Antimony, Tartar Emetic, Glass of Antimony, Kermes, and Golden Sulphuret.

Pulvis Antimonii Compositus, L. Pulvis Antimonialis, E. D.

"*A mixture chiefly of Antimonious acid and Phosphate of Lime, with some Sesquioxide of Antimony and a little Antimonite of Lime.*" E. P.

Few empirical medicines have attained more permanent celebrity than the Fever Powder of Dr. James, commonly called James's Powder, sometimes distinguished in prescriptions as the Pulvis Jacobi verus. As it was found impossible to make the powder by following the Patentee's directions, and chemical analyses having ascertained that it consisted of Phosph. Lime and oxydized Antimony, the College adopted a formula suggested by Dr. Pearson for the preparation of a substitute.

Prep. L. Mix *Tersulphuret of Antimony* powdered ℔j. and *Horn shavings* ℔ij. Put them into a crucible heated to whiteness, stirring constantly till vapours no longer arise. Pulverise the product, and put it into a proper crucible. Heat it with a gradually increasing heat, that it may continue white hot for two hours. Rub the residue to a very fine powder. E. Similar to L.

D. The preparation of the D. P. must contain much more Teroxide than the others. Phosphate of Lime and Oxide of Antimony are precipitated by mixing together solutions of Tartar Emetic, Chloride of Calcium, Phosphate of Soda, and Ammonia.

The Tersulphuret of Antimony, consisting of Sulphur and Antimony, and the horn shavings, of Phosph. Lime cemented by gelatinous matter, become changed by the action of heat. The Sulphur, obtaining Oxygen from the air, escapes as Sulphurous acid; the Antimony being also supplied with Oxygen from the air, is converted into Antimonious acid, and into a small portion, usually about 4 per cent., of Teroxide of Antimony. The animal matter of the horn is burnt off, and the earthy ingredients, or Phosph. Lime, with a small portion of Carbonate, remained intermixed with the oxidized Antimony. During the second heating, some of the Teroxide formed becomes converted into more of the Antimonious acid, a little of which, combining with the Lime of the Carbonate, forms some Antimonite of Lime.

Prop. The powder produced is white, gritty, devoid of both taste and smell. The greatest portion is insoluble in water; but distilled water, as stated in the E. P., boiled on it and filtered, gives with Hydrosul′ an orange precipitate, in consequence of the water dissolving the Antimonite of Lime; this effect will not be perceived if only Antimonious acid is present, for it is insoluble in water. The Lime will be revealed by its appropriate tests. H Cl, digested on the residue, gives an abundant orange precipitate with Hydrosul′. The H Cl dissolves the Terox. Antimony and some Phosph. Lime. After

the precipitate of Tersul. Antimony, if this be separated by filtering, and the solution boiled to expel any traces of Hydrosul′, a white precipitate (*Subphosph. Lime*) is thrown down on the addition of caustic Ammonia.

Comp. Antimonial powder is variable in the proportion of its ingredients. Mr. Phillips found one specimen to consist of

Antimonious acid 35 + Phosph. Lime 65 = 100.
Another: Antimonious acid 38 + Phosph. Lime 62 = 100.

While James's Powder consisted of:

Antimonious acid 56 + Phosph. Lime 44 = 100.

Probably Terox. Antimony is the active ingredient in this powder, the variations in its amount being the cause of the uncertain action of the preparation. Antimonious acid is almost inert.

Mr. Phillips indeed denies that Antimonial Powder contains any Teroxide; but Dr. Maclagan found 3·98 per cent. of it in one specimen, and in James's Powder 2·89. Mr. Brande considers the powder to be very variable in nature, but has found as much as 5 per cent. of Teroxide.

Action. Uses. Diaphoretic, Emetic; but uncertain, as is James's Powder, which is given in doses of grs. v. to grs. xx.

D. gr. iij.—gr. vj. or gr. x. 100 grains have been given without any effect (when containing no Teroxide).

The Teroxide of Antimony, or Tartar Emetic in small doses, are good substitutes for both of these powders.

LIQUOR ANTIMONII TERCHLORIDI, D. Solution of Terchloride of Antimony.

Terchloride of Antimony ($Sb\ Cl_3 = 237$), is the Butter of Antimony of the old writers. It is a soft solid, liquefying at a gentle heat. It was once employed for making the Oxychloride, and has been recommended as a powerful caustic.

The D. C. employ a strong solution, which is precipitated on the addition of water. (*v.* Antimonii Oxidum.)

Prep. ℔j. of *Prepared Sulphuret of Antimony* is dissolved in *commercial Muriatic′* Oiv., by the aid of a gentle heat gradually increased to ebullition. The liquid is filtered until quite clear; boiled down in another vessel to the bulk of Oij.; cooled, and preserved in a well-stoppered bottle. This solution has a Sp. Gr. of 1·470.

Use. An energetic caustic. It spreads, like Caustic Potash, and must be used with the same precautions. It has been recommended for poisoned bites, and for Staphyloma of the Eye.

ANTIMONII TERSULPHURETUM, L. Sulphuretum, E. D.

Native Tersulphuret (*late* Sesquisulphuret) of Antimony. *Antimonium Crudum*. Grey Antimony. *Antimony*. *F.* Sulfure d'Antimoine. *G.* Dreifach Schwefel-Antimon.

Sulphuret of Antimony ($Sb\,S_3 = 177$) is extensively diffused, being found in Hungary, at Borneo, Moulmein, and Pegu, in Persia and in Caubul. It has been employed from time immemorial in Asiatic countries for painting the eyebrows and eyelids. It is the στιμμι and Stibium of the ancients. By fusion in a covered crucible, it is separated from many impurities, and then called Crude Antimony.

Prop. *Crude Antimony* is in roundish dark-coloured loaves, which when fractured, exhibit its peculiar and brilliant striated texture, and dark grey colour, often presenting some prismatic crystals. Sp. Gr. 4·6. It is readily reduced to powder, which is blackish, without taste and smell, but with a reddish hue when the Tersulphuret is very pure; insoluble in water; permanent in the air; fused at a moderate temperature, and volatilized in close vessels. Heated in the air, some Sulphurous acid is formed, as well as impure and mixed Oxides of Antimony. It is soluble in solution of Potash or Soda (*v.* Antimonii Oxysulphuretum), also in H Cl. It may also be dissolved in Nit′, which, parting with its Oxygen to both the metal and the Sulphur, converts the one into an Oxide and the other into Sul′; and these, combining together, form a Sulphate of Antimony, which is dissolved in the remaining Nit′.

Tests. Seldom quite pure, being apt to contain some of the Sulphurets of Iron, Arsenic, Lead, and Copper. The L. and E. P. give the solubility in H Cl as a sufficient test of its purity. The solution when obtained will deposit on dilution the white Oxychloride; while the clear liquid, still containing Antimony, will give an orange precip. with H S. Any Iron or Arsenic will disappear in the P. processes in which this ore is used. The Iron will give a yellow tinge to the solution in H Cl, and both Lead and Copper may be detected by their tests after the precipitation of the Antimony. The Arsenic may also be tested by reducing it with a mixture of Charcoal and Carb. Soda, or by heating together equal parts of the Tersulphuret and Cream of Tartar for three hours, when an alloy is formed of Potassium and Antimony. This, when added to water, decomposes it: Hydrogen combined with Arsenic, or Arseniuretted Hydrogen, escapes, which, being tried with Marsh's test, the Oxide or a stain of metallic Arsenic is obtained.

By levigation and elutriation, as in the case of Prepared Chalk, the Tersulphuret is reduced to a fine powder, as when prepared in—

ANTIMONII SULPHURETUM PRÆPARATUM, D.

Prep. Reduce to powder *Sulphuret of Antimony*, q. s. as directed in the preparation of Chalk. Preserve the most subtle particles for use.

Action. Uses. Diaphoretic, Alterative, Emetic; but uncertain, as it may be more or less oxidized by acid in the Stomach.
D. gr. x. or gr. xx.—ʒj.

ANTIMONII OXYSULPHURETUM, L. Antimonii Sulphuretum Aureum, E. Antimonii Sulphuretum Præcipitatum, D.

Oxysulphuret and Golden Sulphuret of Antimony. *Sulphur Antimonii Præcipitatum.* *F.* Soufre doré d'Antimoine. *G.* Goldschwefel.

Several Sulphurets of Antimony have long been employed in medicine. The present was known to Basil Valentine. Kermes Mineral is considered to have been discovered by Glauber, and made known through one of his pupils to La Ligerie, from whom, in 1720, the French government bought the secret of its preparation.

The precipitated Sulphuret, or Oxysulphuret, may be formed in several ways:—1. By boiling Sulphuret of Antimony with Carb. Potash or Soda. 2. With a caustic alkali. 3. By melting at a red heat a mixture of Sulphuret of Antimony and an alkaline Carbonate, and then treating the melted mass with boiling water. The Sulphuret, when boiled in a solution of Potash, becomes dissolved; but, on cooling, a reddish-brown powder is deposited, which is considered to be similar to the Kermes Mineral of old authors. But if we add an acid before the deposit takes place on cooling, an orange-red precipitate is produced, which is the officinal preparation, and supposed to be analogous to the Golden Sulphuret of the older Materia Medica.

Prop. The Oxysulphuret of Antimony, called Golden Sulphuret in the E. P., is in powder and of an orange-red colour, devoid of smell, and with little taste. It is insoluble in water, but soluble with the aid of heat, in alkalis. Acted on by H Cl or Nitro-H Cl, it becomes dissolved, with the exception of a little Sulphur. Heated in a tube, Sulphur sublimes; in the air, it burns with a blue flame, with evolution of Sulphurous acid gas, leaving as a residue the oxidized metal. It is probably a mixture of the Tersulphuret and Teroxide of Antimony in certain proportions, although Dr. Pereira doubts the presence of the latter, and cannot discover any crystals of it by the microscope. Mr. Phillips dissolved out 12 per cent. of the Oxide by boiling in a solution of Bitartrate of Potash. He considered the preparation to consist of 1 Eq. of $Sb\,O_3$, 5 of $Sb\,S_3$, and 15 of water. It is curious that the Equiv. of Sulphur and of water are equal in number.

Prep. L. Mix powdered *Tersulphuret of Antimony* ℥vij. with *Liquor Sodæ* Oiv., and *Dist. Water* Oxvj.; boil for 2 hours over a slow fire, continually

stirring, and adding *Dist. Water* that it may fill up the same measure. Strain the solution, and pour in gradually *dil. Sulph. Acid,* q. s., to precipitate the *Oxysulphuret.* Wash away the Sulphate of Soda, and dry the powder with a gentle heat.

E. Similar: Caustic Potash, the Sulphate of which is more insoluble, being used instead of Soda.

D. The *Prepared Sulphuret* (℥v.) is heated in a crucible with *Carb. Potash* (℥iv.); when effervescence has ceased, the mixture is raised to redness until liquified; when cool, powdered, boiled in Oviij. of *water,* and precipitated by *dil. Sulph. Acid* as above.

It seems that when the Tersulphuret is boiled with the solution of Soda, an exchange of elements first takes place. By this some Teroxide of Antimony and Sulphuret of Sodium are formed. The latter dissolves some unchanged Tersulph. Antimony, by forming with it a soluble double Sulphuret. Again, the Teroxide of Antimony is held in solution by some undecomposed Soda, with which it forms a kind of Salt. Both of the compounds thus formed are again decomposed by the addition of $S\,O_3$.

Sulphate of Soda, Oxysulphuret of Antimony (hydrated), and perhaps some H S, are formed. The Oxysulphuret precipitates.

$$(Sb\,S_3,\,Na\,S)+S\,O_3+H\,O=Na\,O,\,S\,O_3+Sb\,S_3+H\,S$$

and,

$$(Sb\,O_3,\,Na\,O)+S\,O_3=Na\,O,\,S\,O_3+Sb\,O_3.$$

Tests. 12 times its weight of H Cl, aided by heat, will dissolve most of it, forming a colourless solution, and leaving a little Sulphur. It is completely sol. in boiling Liq. Potassæ, L.

Action. Uses. Alterative, but uncertain; in large doses, Emetic.

D. gr. j.—gr. v.

Pharm. Prep. Pilulæ Hydrargyri Chloridi Comp., or Plummer's Pills.

Antimonii Potassio-Tartras, L. Antimonium Tartarizatum, E. D.

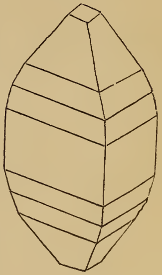
Tartrate of Antimony and Potash. Potassio-Tartrate of Antimony. Tartarized Antimony. Tartar Emetic. *F.* Tartre émétique. *G.* Brechweinstein.

The discovery of this salt is attributed to Mynsicht (Thesaurus, &c. Hamburgh, 1631). It is a Tartrate of Potash and Teroxide of Antimony, and was at first made with Cream of Tartar and Liver of Antimony.

Prop. Tartrate of Antimony and Potash ($Sb\,O_3,\ K\,O,\ C_8\,H_4\,O_{10},\ 3\,H\,O=360$), or Tartar Emetic, is usually seen as a white powder, but it crystallizes readily from a saturated solution, in tetrahedra, or in octohedra with rhombic bases. They are colourless and transparent, without smell, but have a nauseous, styptic, and slightly

acid taste. Exposed to the air, they become opaque, and covered with a white powder, losing 4 or 5 parts per cent. of weight. The crystals are insoluble in Alcohol, but soluble in proof Spirit and in Wine, also in about 14 times their weight of temperate and about twice their weight of boiling water. The solution reddens Litmus, and, when diluted, soon undergoes decomposition. Heated, the crystals decrepitate, become charred, and leave a pyrophoric alloy of Antimony and Potassium. The solution is decomposed by the alkalies and alkaline earths, as well as their Carbs. (hence common water, containing Carb. Lime or of Magnesia, precipitates the Oxide Antim.); likewise by strong acids. Hydrosul′ throws down the Antimony in the form of an orange-red precipitate of Hydrated Tersulphuret, as do also the Hydrosulphates of Ammonia and of Potash. The juices of many plants also, and astringent decoctions, throw down the Oxide of Antimony as an insoluble compound. So much is this the case, that powder of Cinchona and of Galls, as well as a decoction of the latter, prevent the emetic effects of Tartarized Antimony. The decoctions of Cinchona, Kino, and Rhatany, only partially neutralize its effects.

Fig. 29.



The Tartrate of Potash and of Antimony is composed of Tar′ 36·6 +K O, 13·3+Sb O_3 42·6+Aq. 7·5=100. Or, in Equivalents.

1 Eq. of Tartaric Acid	$=C_8\ H_4\ O_{10}$	=132
1 Eq. of Potash	=KO	= 48
1 Eq. of Terox. Antim.	$=Sb\ O_3$	=153
3 Eq. of Water	=3 H O	= 27
		360

Sb O_3 occupies the same place in this salt as Na O and $Fe_2\ O_3$ in the Potassio-tartrates of Soda and Iron. (q. v.).

Prep. The object in view in the various modes of preparing this salt, is first to obtain, by acting on the Tersulphuret, a Teroxide of Antimony; and, in the second place, to bring this in contact with Supertartrate (Bitartrate) of Potash, so that Sb O_3 may replace the Eq. of basic water in that compound, (K O, H O, $\bar{T}$).

L. Mix *Tersulph. Antimony,* rubbed to the finest powder, ℔j., with *Sulph. Acid* f℥xv. in an iron vessel; to these apply a slow fire beneath a chimney. stirring frequently with an iron spatula; then increase the fire, until, the flame of the ignited Sulphur being extinguished, nothing remains but a whitish pulverulent mass. Wash this with water till free from acid reaction, and dry. Mix carefully ℥ix. with *Bitart. Potash* ℥x. and boil for half an hour in *Dist. Water* Ov. Strain while hot; set aside that crystals may form. The solution being poured off, again evaporate and crystallize it. Dry the crystals.

During the combustion the Sulphur of the Sulphuret is burnt off as Sulphurous Acid. 1 Eq. of $S\,O_3$ supplies 3 O to the Antimony (the S being also burnt), and 3 other Eq. combine with the Teroxide thus formed, forming a Tersulphate ($Sb\,O_3$, $3\,S\,O_3$). By washing with water, this last is decomposed into some soluble Supersulphate, and an insoluble Disulphate of Antimony ($2\,Sb\,O_3$, SO_3).

When boiled with 2 Eq. of Bitartrate of Potash, 2 Eq. of Tartar Emetic are formed by $2\,Sb\,O_3$ replacing 2 H O, (*vide supra*), and when this is crystallized out, $S\,O_3$ remains in the solution.

The E. and D. Colleges direct a Teroxide to be prepared from a Terchloride formed by the action of H Cl on the Tersulphuret (*v.* p. 189). Take of the precipitated *Teroxide* ℥iij. and mix it with *Bitart. Potash* ℥iv. ʒij. Add to it *Aq.* f℥xxvij., boil for an hour, filter and crystallize by cooling. Evaporate the mother liquor for more crystals, which may require to be dissolved again and recrystallized. (E. C.) D. Similar.

The Teroxide of Antimony employed has adhering to it a little of the Chloride. On being boiled in water, the latter is resolved into Teroxide and H Cl from the decomposition of the water. The Teroxide unites with the Bitart. Potash, and as the Tartar Emetic crystallizes, the H Cl remains in solution and retains any Iron or other metallic impurity which may be present. (c.)

Tests. As Tartar Emetic in powder is apt to be adulterated, it is preferable to buy it in well-formed crystals. In this country it is most commonly adulterated with Bitart. Potash and Oxide of Iron, and with the former more frequently; the latter gives it a yellow tinge. It is totally soluble in water, and with this solution Ferrocyanide of Potassium gives no precipitate, but H S produces an orange precip. of Tersulphuret. Nit′ precipitates the oxide, which is soluble in an excess of the acid. Neither Chlor. Barium, nor Nit. Silver, precipitates anything but what is dissolved by the addition of water. (No Sulphates or Chlorides.) From 100 grs. dissolved in water, Hydrosulph. Acid precipitates 49 grs. of Tersulphuret of Antimony. L. P. A solution in 40 parts of water is not affected by its own volume of a solution of 8 parts of Acet. Lead in 32 parts of water and 15 parts of Acet′. E. P. This acid solution of Acet. Lead, suggested by M. Henry and adopted by the E. P., is so delicate as to detect less than one per cent. of Bitart. Potash; but Dr. C. states that he has experienced some difficulties in using this test.

Inc. Acids, alkalis, and their Carbs.; some of the earths, and metals, and their oxides; Lime-water, Chlor. Calcium, and Acetates of Lead; vegetable infusions, and decoctions, as of Cinchona, Catechu, &c.

Action. Uses. Irritant poison, Alterative, Diaphoretic and Expectorant, Nauseating Sudorific, Emetic, Contra-Stimulant. *Ext.* Counter-Irritant, Rubefacient.

D. Alterative, gr. $\frac{1}{16}$ to $\frac{1}{8}$. Diaphoretic and Expectorant, gr. $\frac{1}{8}$ to $\frac{1}{6}$. Nauseating Sudorific, gr. $\frac{1}{4}$ to $\frac{1}{2}$. Emetic, gr. j.—gr. ij. diluted. Contra-Stimulant, gr. j.—gr. iij. every 2 or 3 hours.

Antidotes. Excite vomiting by mechanical irritation in the fauces, or with draughts of warm water; or use the stomach pump. The best antidotes are astringent vegetable decoctions or infusions, as of Gall-nuts or of Cinchona, as these form insoluble Tannates with the Teroxide of Antimony.

VINUM ANTIMONII POTASSIO-TARTRATIS, L. Vinum Antimoniale, E. Liquor Antimonii Tartarizati, D. Antimonial Wine.

Prep. L. Take *Potassio-Tartrate of Antimony* ℈ij., dissolve it in *Sherry Wine* Oj. E. D. Both of the same strength as L. The E. prep. is also made with wine, but the D. C. substitutes weak spirit.

Action. Uses. Alterative and Diaphoretic and Emetic.

D. ♏x.—fʒij. every 3 hours. Each f℥ contains 2 grs. of Tartar Emetic. f℥ß or f℥j. may be given in fʒj. doses, or a teaspoonful every 5 or 10 minutes, to act as an Emetic.

UNGUENTUM ANTIMONII POTASSIO-TARTRATIS, L. Ung. Antimoniale, E. Ung. Antimonii Tartarizati, D. Tartar Emetic Ointment.

Prep. L. Take *Potassio-Tartrate of Antimony* rubbed to very fine powder ℥j., *Lard* ℥iv. Mix. E. Similar.
D. Half as strong as L.

Action. Uses. Counter-Irritant. ʒß. applied twice a day by friction on the skin, produces a pustular eruption.

HYDRARGYRUM, L. E. D.

Argentum vivum et liquidum. Mercury. Quicksilver. *F.* Mercure. Vif-argent. *G.* Quecksilber.

Mercury (Hg=200), or Quicksilver, was known to the ancients. The Romans seem to have employed it as a medicine externally, as did the Arabs; but the Hindoos were probably the first to prescribe it internally. It is found in China, at Almaden in Spain, and Idria in Carniola, likewise in South America. It occurs occasionally in metallic globules; usually as the native Bisulphuret or *Cinnabar;* combined with Silver, forming a *Native Amalgam;* or with Chlorine, as in *Horn Mercury.* It is chiefly obtained from the Sulphuret by distillation with Lime or with Iron, which combining with the Sulphur, the metal distils over and is condensed.

Prop. Mercury is remarkable among metals for existing as a liquid at ordinary temperatures, and for its silver-like colour and lustre. It is without taste or smell. Sp. Gr. 13·568. Freezes at —40°; crystallizes in octohedra, becomes malleable, and has a Sp. Gr. of 14 from the contraction. It boils at 660°, and is converted into colourless vapour of great density. (According to Faraday, it is converted into

vapour at ordinary temperatures.) It is unalterable in the air, except with the aid of heat, when it slowly combines with Oxygen, and forms the Red or Binoxide, and a greyish powder (Black Oxide or *Æthiops per se*), which is a Protoxide. By increase of heat, the Oxygen is again expelled. Mercury combines with Chlorine and Bromine in two, and with Iodine in three proportions; with Sulphur it forms a black and a red Sulphuret. It unites with several metals, especially Gold, Silver, Lead, Tin, Bismuth, Zinc, which it dissolves, and with which it forms amalgams. Cyanogen unites with it to form Bicyanide of Mercury. All the acids combine with its Oxides and form salts, the Nitric acid most easily, even when diluted, and at ordinary temperatures. Solutions of Mercury may be decomposed by introducing into them a piece of clean Copper, on which a thin layer of Mercury will become deposited. Sulphuretted Hydrogen will throw down a black Sulphuret of Mercury. Caustic Potash or Soda will give a grey precipitate with the salts of the Protoxide, and a reddish-yellow one with those of the Peroxide. Ammonia, on the contrary, deposits double salts, as the Hydrarg. Ammonio-Chloridum. Most of these compounds will be treated of in the following pages.

Tests. Mercury may be adulterated with Lead, Tin, Bismuth, &c. when it loses its lustre, especially if shaken. "A globule moved along a sheet of paper, leaves no trail," (E.) indicating that these are not present; but pure Mercury, if moist, will form this trail. The L. C. direct that the Mercury of commerce should be strained, to free it from mechanical impurity. The Sp. Gr. should be 13·5; the metal entirely vaporizable; and none should adhere to a sheet of paper over which it is rolled. (L.) Pure Mercury is insoluble in cold sulphuric and in boiling hydrochloric acids. Thus neither of the acids, after this test, should leave any residue on evaporation. The several metals may be distinguished by their respective tests.

Hydrargyrum Purum, D.

The Mercury of commerce is now usually pure enough for Pharmaceutic purposes; but the D. P. has a formula for its purification.

Prep. Mercury ℔iij. *av.*; distil ℔ij. with a gentle heat. The product is boiled with pure *Muriatic* f℥ß., diluted with *Dist. Water* f℥ij.; well washed, and dried.

Preparations of Mercury.

Though Mercury, in its metallic state, is generally said to be inert, there are several valuable preparations in which the principal portion of it exists chiefly in that state. In these, the Mercury, by long trituration with dry powders, viscid confections, or greasy substances, gradually loses its fluidity and metallic lustre, and becomes what is called *extinct* or *killed*. It is, in fact, reduced to a dark grey mass, in

which, when moist and well-prepared, globules cannot be distinguished even with a magnifier of moderate powers. But although a portion of the Mercury is oxidized, the greater portion, though finely divided, is in a metallic state; for if rubbed on Silver or Gold, the white mercurial stain will readily be displayed.

Hydrargyrum cum Creta, L. E. D.

Mercury with Chalk. *Grey-powder.* Mercurius Alkalizata.

Prop. A heavy powder of a greyish colour; without smell; has a slight metallic and chalky taste; insoluble in water, but its Carbonate of Lime is readily acted on by acids.

Prep. L. Rub together *Mercury* ℥iij. and *Prepared Chalk* ℥v. until globules are no longer visible. E. The same.
D. ℥j. to ℥ij. av. similar.

This preparation contains about 3 parts in 8 of metallic Mercury in a very fine state of subdivision, in which condition it seems capable of acting on the system. When heated strongly, nothing is left but Chalk. Digestion in Acetic′ dissolves the Chalk, leaving the Mercury. A minute portion of the metal probably becomes oxidized during the process of trituration, more particularly when water is added to the Chalk, as recommended by Mr. Phillips, or when the Mercury is first rubbed with Manna, as ordered in the old edition of the D. P. Dr. Nevins has proved that a little (about ½ a grain in 100 grains of the Hydrarg. c. Creta) is in the state of Protoxide. Dr. N. dissolved away the Chalk with H Cl, and thus converted the Oxide, if any were present, into Chloride of Mercury. After washing, the residue was digested in dil. Nit′ to remove metallic Mercury, and the white powder or Chloride left. This became black when touched with Liq. Potassæ, &c. (P. J. iv. 412.)

Tests. Part is evaporated by heat; what remains is colourless and totally soluble in Ac′ with effervescence: this solution is not coloured by Hydrosul′. The ingredients can scarcely be so diligently triturated as that no globules shall be visible.

Inc. Acids and acid salts. Sulphates, Acetate of Lead.

Action. Uses. Mild Alterative and Cathartic, also Antacid.

D. gr. v.—℈ß. for adults; gr. ij.—gr. v. for children, in powder or some viscid substance.

Hydrargyrum cum Magnesia, D.

Prep. Rub *pure Mercury* ℥j. and *Carb. Magnesia* ℥ij., in a porcelain mortar, until the globules of Mercury cease to be visible, and the mixture acquires an uniform grey colour.

Action. Uses. Similar to the former. The Magnesia will make it more laxative in cases of acidity; but it is seldom employed.

PILULA HYDRARGYRI, L. PILULÆ, E. D.

Pills of Mercury. *Pilula Cærulea.* Blue Pill.

These form a mass of a bluish colour and soft texture, in which most of the Mercury is minutely subdivided and a small portion oxidized.

Prep. L. Rub together *Mercury* ℥ ß. and *Confection of Roses* ʒ vj., till globules can no longer be seen. Then add *Liquorice* in powder ʒ ij. Beat the whole till incorporated. E. D. Similar.

Steam power is now usually employed, which is an advantage, as the efficacy of the pill depends upon the extent to which the extinction is carried. It has been proposed to effect this by means of stearine, and then to add the Rose Confection. It ought to display no globules when rubbed on paper. Dr. Nevins has shown, as in the case of the Hydrarg. c. Creta, that a small portion, about $\frac{3}{4}$ gr. in 100 grs. of the Pill, is in the state of an Oxide. (P. J. iv. 412.) If washed with boiling water, this ought to give no indications of Sul′ with Chloride of Barium, as this acid is sometimes added to heighten the colour of the Confection, by which a poisonous Subsulphate is produced.

Action. Uses. Alterative, Cathartic. Employed to affect the system with Mercury, as in Syphilis, and many inflammations.

D. gr. iij.—v., or even gr. xv., to act as a purgative. gr. v., morning and evening, are prescribed to induce salivation, sometimes conjoined with a little Opium, to prevent the Mercurial from acting on the bowels. 3 grs. of the Pill contain 1 gr. of Mercury.

UNGUENTUM HYDRARGYRI, L. E. D.

Mercurial or Blue Ointment. *F.* Onguent Mercuriel.

Mercury in this form seems to have been employed medicinally by the Romans. Pliny says that Mercury is poisonous, " unless, indeed, it is to be administered in the form of an unction on the belly, when it will stay bloody fluxes." (Holland's Transl. lib. 33. c. 8.) It was subsequently employed by the Arabs, and thence reintroduced into European practice.

Prep. L. Take *Mercury* ℔j., *Lard* ℥ xiß., *Suet* ℥ ß. Rub the Mercury with the Suet and a little of the Lard, until globules can no longer be seen. Add the rest of the Lard and mix. E. D. Same strength.

Trituration produces extinction of the Mercurial globules, and with this some degree of oxidation. This has been denied by some skilful experimentalists; but, as it depends upon the mode and extent to which the trituration has been carried, the oxidation may not be observed when the trituration has been less effective. It has been

ascertained that simple trituration is not sufficient, for globules continue to be observed with a magnifier of four or five powers. The complete extinction is best effected by the assistance of steam power, and by allowing the mixture to remain exposed to the air, triturating occasionally; so that the operation is not completed for some weeks: it has also been recommended to triturate the mixture with some old Mercurial ointment, or, as Soubeiran recommends, with Lard that has been exposed in thin layers in cellars from fifteen days to some months.

M. Guibourt and Messrs. Vogel and Boullay assert that, according to their experiments, the Mercury in the above Ointment remains for the most part in a metallic state. M. Guibourt found only a 500th part of the Ointment to consist of an Oxide of Mercury combined with a fatty acid. Dr. Christison, however, states that he has never failed to detect a sensible proportion of Oxide. On melting the ointment in a long tube, there is obtained a short column of Mercury at the bottom, and a long superstratum of yellowish, almost perfectly transparent oil. This, even when filtered, becomes intensely black with Sulphuretted Hydrogen; and if agitated with successive portions of dil. Ac′ at 150°, an acid liquor is obtained, which gives a copious black precipitate of Sulphuret of Mercury with the same reagent. Hence, Mercury must be present in the form of an Oxide combined with a fatty acid, and (Dr. C. calculates) in the proportion of about one per cent. of the ointment, or a fiftieth of the Mercury used. Mr. Donovan many years since proved that the superior stratum of melted ointment contained only one-fifth of the original Mercury, but was as energetic as ever in producing the effects of Mercury. He therefore conceived it to consist partly of uncombined metal and lard, and partly of a chemical compound of the Protoxide and Lard: to the latter portion alone he attributed any medicinal efficacy. Dr. Paris, long since, in his Pharmacologia, recommended the adoption of an ointment made with the Oxide of Mercury. Dr. Christison also concludes that the small proportion of Oxide either present at first, or formed during the process of rubbing the Ointment into the skin, is the only active part of the Mercury. Such is likewise the opinion of Dr. Bærensprung (P. J. x., 554). It is probable that the formation of this active Protoxide of Mercury depends on the oxidation or rancidity of the fatty matter of the ointment.

Tests. Mercurial Ointment is apt to be carelessly made, or with too little Mercury. Its colour should be compared with that of some genuine Ointment. Its Sp. Gr., 1·78, should be ascertained. When rubbed on paper, no globules should be visible with a magnifier of four powers; though innumerable ones may be seen with a powerful microscope (as represented in P. J. iii. 399). The fatty matter may be separated by means of boiling water or Ether, &c., and the residual mercury weighed. Prussian Blue is sometimes added to heighten the colour.

Action. Uses. Rubbed on the skin, or taken internally, affects the constitution with Mercury, as indicated by salivation. Useful dressing to Syphilitic and other sores.

D. Contains equal parts of Mercury and Lard (with Suet). ʒß—ʒj. rubbed morning and evening or more frequently, on the inside of the thighs or arms, or elsewhere, will speedily salivate. The patient should be kept warm and in the same clothing, the hand of the operator being protected with bladder, &c. On the Continent, grs. ij.—v. made into pills with Liquorice, are given internally to produce speedy salivation. The practice is worthy of adoption in extreme cases, especially in hot climates.

Ceratum Hydrargyri Compositum, L. Compound Cerate of Mercury.

Prep. Rub together *Ointment of Mercury, Compound Soap Cerate,* āā ℥vj., *Camphor* ℥ißs.

Action. Uses. Applied to chronic enlargements of the joints, and to disperse indolent tumours.

Linimentum Hydrargyri, L. D. Compound Liniment of Mercury.

Prep. L. Rub *Camphor* ℥j. with *Rectified Spirit* fʒj., then add *Lard* and the stronger *Ointment of Mercury* āā ℥iv., still rubbing. Gradually pour in *Solution of Ammonia* f℥iv. Mix the whole. D. Similar.

Action. Uses. A liquid form of Mercurial Ointment combined with stimulants, and, like the last preparation, employed to promote absorption, and hence to discuss indolent tumours, &c.; sometimes to excite salivation more readily, by its stimulant action on the lymphatics. The Mercury is suspended in a kind of soap formed by the lard with the Ammonia.

Emplastrum Hydrargyri, L. E. D. Mercurial Plaster.

Prep L. Add *Sulphur* gr. viij. to *Olive Oil* fʒj., stirring till they unite. Triturate with these *Mercury* ℥iij. till the globules disappear. Add gradually *Plaster of Lead* ℥xij., melted with a gentle heat, and mix them all.

E. D. Both use *Resin* instead of Sulphur. The D. C. use Turpentine instead of Olive Oil. The L. plaster contains 1-5th Mercury, the E. and D. rather more than 1-4th.

In the L. process Sulphuretted Oil is first produced, and a little Sulphuret of Mercury is afterwards formed, most of the metal being mechanically subdivided. There can be no Sulphuret in the E. and D. Plasters.

Action. Uses. Applied as a plaster, it stimulates the lymphatics of the part, whether this be a chronically enlarged joint, a node, glandular enlargement, or chronically diseased liver or spleen.

EMPL. AMMONIACI CUM HYDRARGYRO, L. E. D.

Prep. L. Add *Sulphur* gr. viij. gradually to *Olive Oil* f℥j., previously heated, stirring till they unite. Triturate *Mercury* ℥iij. with these till the globules disappear. Add gradually *Prepared Ammoniac* ℔j. melted. Mix carefully. (*Prepared Ammoniacum* is here substituted for the *Lead Plaster* in the last preparation.) E. The same.

D. *Ammoniac Plaster* ℥iv. is melted with *Merc. Plaster* ℥viij.

Action. Uses. Similar in its effects to the last, but usually considered more effective. Applied to discuss enlargements of glands and joints, or to indolent tumours.

HYDRARGYRI PROTOXIDUM.

Protoxide of Mercury. Suboxide of some Chemists. (Pereira.) *Hydrargyri Oxydum cinereum.* *F.* Protoxide de Mercure. *G.* Quecksilberoxydul.

The Protoxide (Hg O=208) of Mercury is a dark grey powder, devoid of taste and smell; heavy; Sp. Gr. 10·69 ; insoluble in water; easily decomposed by light, and by a heat even of 212°, being resolved into metallic Mercury and some Binoxide, when it becomes of a yellowish or olive hue. Dissipated at 600°. Readily dissolved by Acetic′ or by dil. Nit′, from which it will be again precipitated by the alkalis. Hydrochloric Acid, or the soluble Chlorides, will give a white precipitate (Calomel) in solutions of its salts. These are also precipitated black by Potash or by H S ; and the metal itself is precipitated on the introduction of a piece of clean Copper. It may be prepared by mixing Calomel with Lime-water, when Chloride of Calcium is found in the solution, and the Oxide of Mercury precipitated. It should be dried at a moderate heat, and kept from the light. A small portion of this Oxide has been detected in Hydrarg. c. Creta, Pil. Hydrarg. and Ung. Hydrargyri. Comp. Hg 96·2, O 3·8=100. This Oxide is not now officinal.

Action. Uses. A mild Mercurial; but uncertain in composition, and therefore seldom if ever used internally. Mr. Donovan recommended it to be employed for making Ung. Hydrargyri.

D. gr. j.—v. Employed sometimes in fumigations. Externally as an Ointment, 1 part to 3 or 5 of Lard; or as a Lotion in BLACK WASH (*Lotio Nigra*), prepared by mixing *Calomel* ʒj. with *Lime-water* Oj., and shaken up when used.

HYDRARGYRI BINOXIDUM.

Binoxide of Mercury. Red and Peroxide of Mercury. Oxide of Mercury of some chemists. (Pereira.) *Calcined Mercury.* *F.* Deutoxide de Mercure. *G.* Rothes Quecksilberoxyd.

The Red Oxide of Mercury (HgO_2=216) has long been employed in medicine, being one of the preparations which was known to Geber.

This Oxide, as well as the last, has been omitted in the last edition of the L. P., being seldom used in medicine at the present day.

Prop. Binoxide Mercury is an orange-red powder, without smell, but having a disagreeable metallic taste. Sp. Gr. about 11·0. Nearly insoluble in water. It is, however, soluble in boiling water to the extent of 1 grain in f℥xvj. or about a 7000th. (*c.*) Dr. Barker also found 0·62 parts soluble in 1000 of water. It is decomposed by light and heat, changing colour, and at a heat below redness giving out Oxygen, the Mercury becoming sublimed. It is readily dissolved by Nit′ and H Cl, also by Ac′ and Hydrocyanic′. Comp. Hg 92·7 + O 7·3 = 100.

It may be prepared by keeping metallic Mercury for some time at a heat of 600° in a narrow mouthed vessel, when it undergoes oxidation and becomes converted into red scales of Binoxide. Or the solution of Bichlor. Mercury may be precipitated by Liq. Potassæ, and the Oxide thus obtained dried at a gentle heat.

$$Hg\,Cl_2 + 2\,K\,O = 2\,K\,Cl + Hg\,O_2.$$

The solution in H Cl answers to the tests for Bichloride of Mercury, (q. v.)

Tests. When heated, it gives off Oxygen, and Mercury is left in globules, or is entirely dispersed. (Brick-dust, or the Oxides of Iron or of Lead will be left.) It does not emit Nitrous vapours when heated; is entirely soluble in H Cl. Water in which it is boiled or washed yields no precip. to solution of Nit. Silver (showing that no Corrosive Sublimate is present).

Uses. The Nitrico-oxide is an impure Binoxide, and the latter is also contained in *Yellow Wash.* The pure Binoxide is seldom employed.

Hydrargyri Nitrico-Oxidum, L. Oxidum Rubrum, E. D. Nitric Oxide of Mercury. Red precipitated Mercury, or Red Precipitate.

Prep. L. Mix *Mercury* ℔iij. with *Nitric Acid* f℥xviij., and *Dist. Water* Oij., and apply a gentle heat until the Mercury is dissolved. Boil down the liquor, and rub what remains to powder. Put this into another very shallow vessel, apply then a slow fire, gradually increased until fumes cease to be given off.

E. D. Process similar: both use more Mercury. The E. P directs that the mass be constantly stirred during the oxidation. Many, however, advise that it should be left undisturbed.

Mr. Brande recommends that on the large scale the proportions of 100 pounds of Mercury to 48 of Nitric′ (Sp. Gr. 1·48), should be adopted, from which 112 pounds of the Nitric Oxide may be obtained.

In the first part of the above process a Protonitrate of Mercury is formed, from 2 Eq. of the metal, and 2 of Nit. Acid. 1 Eq. of the latter gives up O to the Mercury, giving off Nitrous Acid, and the other Eq. combines with the Protoxide thus produced.

$$Hg + 2\,N\,O_5 = Hg\,O,\,N\,O_5 + N\,O_4.$$

When the Protonitrate is heated, the $N O_5$ is again decomposed. Again it yields up O to Hg O to form the Binoxide ($Hg O_2$), and $N O_4$ escapes as before. This Binoxide is left in the form of orange-red scales.

$$Hg O, N O_5 = Hg O_2 + N O_4.$$

But since a small quantity of $N O_5$ almost always escapes decomposition, a little Pernitrate of Mercury is formed at the same time. ($Hg O_2 + N O_5$.) This renders the preparation more acrid and irritant than the pure Binoxide.

Tests. It consists of crystalline, shining red scales; and is soluble in H Cl and $N O_5$. At a high temperature it is entirely sublimed, *emitting no red vapours.* L. (Some exception must be made to the last rule, or this preparation would differ in no respect from the pure Binoxide.)

Action. Uses. Irritant, Stimulant. As a powder sprinkled over indolent ulcers, or as a Caustic to repress exuberant granulations. A Lotion common called *Yellow Wash*, formed in the proportion of gr. 1—2 of *Calomel* to f℥j. of *Lime-water*, which contains Chlor. Calcium in solution and a precipitate of yellow Hydrated Binoxide, is prescribed in similar cases, and should be used only when shaken up. The Nitric oxide has been given internally in doses of $\frac{1}{8}$ to 1 grain in pills, but is objectionable.

Unguentum Hydrargyri Nitrico-Oxydi, L. Ung. Oxidi Hydrargyri, E. Ung. Hydrarg. Oxydi Rubri, D. Red Precipitate Ointment.

Prep. L. Take *Nitrico-Oxide of Mercury* ℥j., *Lard* ℥vj., *White Wax* ℥ij. Melt the Lard in the Wax, add the Oxide in very fine powder. Mix. E. D. Similar.

This Ointment, when fresh made, is of bright scarlet colour; but the Oxide by degrees becomes deoxidized, as is evident from the colour changing first to a greyish-red and then to a bluish-grey.

Action. Uses. Stimulant, applied to indolent sores, and to the eye-lids, in Chronic Ophthalmia.

Hydrargyri Iodidum, L. H. Iodidum Viride, D.

Iodide or Protiodide of Mercury. Subiodide of some Chemists. *F.* Proto-Iodure de Mercure. *G.* Quecksilberiodür.

Iodide of Mercury ($Hg I = 326$) has not been long introduced into medicine, its employment having been first indicated by M. Coindet. It occurs as a heavy greenish-yellow powder, sublimed by heat, insoluble in water and Alcohol, also in a watery solution of Chlor. Sodium, by which it is easily separated from the Biniodide; soluble in Ether and acids. It is decomposed by light; reddened by

heat, but becoming yellow on cooling. By a higher degree of heat it is resolved into Metallic Mercury and the red Iodide. Comp. Hg. 55·5+I 44·5=100.

Prep. L. D. Rub together *Mercury* ℥j. and *Iodine* ʒv., adding gradually *Alcohol* q. s. till the globules disappear. With a gentle heat dry the powder immediately out of access of light. Keep in well-closed bottles, made of black glass.

The Mercury and Iodine being mixed in equivalent proportions, and triturated, considerable heat is produced, sometimes to danger of explosion; the Alcohol is added to dissolve the Iodine, which being thus presented in a finely divided state to the Mercury, the latter becomes rapidly extinguished. It acts also on some Biniodide of Mercury which is formed at first, and facilitates its combination with metallic Mercury. The Iodide of Mercury may also be formed by precipitating or mixing together a solution of Iodide of Potassium with one of Protonitrate of Mercury having a slight excess of Nitric′. (Soub. ii. 515.)

Tests. Yellowish when recently prepared; when heat is cautiously applied it sublimes in red crystals, which afterwards become yellow, and blacken by access of light. It is not soluble in Chlor. Sodium. (L.) Any impurity will appear if the Iodide does not answer to all these characteristics. (Both light and heat will generally resolve it into Metallic Mercury and the red Biniodide.)

Action. Uses. Irritant Poison. Alterative Stimulant in Syphilis occurring in scrofulous patients. Both the Iodides, if continued, will produce the effect of Mercurials.

D. gr. j.—gr. iij.

Unguentum Hydrargyri Iodidi, L. Ointment of Iodide of Mercury.

Prep. Melt *White Wax* ℥ij. and *Lard* ℥vj., add finely powdered *Iodide of Mercury* ℥j. Mix.

This Ointment may be rubbed in; or applied as a dressing to scrofulous sores.

Hydrargyri Biniodidum, E. Hyd. Iodidum Rubrum, D.

Biniodide of Mercury. Periodide, and Red Iodide of Mercury. Iodide, of some Chemists. *F.* Deutoiodure de Mercure. *G.* Doppelt Iodquecksilber.

Biniodide of Mercury ($Hg\,I_2=452$) is a powder of a beautiful scarlet colour, insoluble in water. By heat cautiously applied, it is sublimed in scales, which soon become yellow, and, when cold, red. It is partially soluble in boiling rectified Spirit, which affords crystals as it cools. It is dissolved by hot solutions of Iodide of Potassium and Bichloride of Mercury, but precipitated from both on cooling. It

is totally soluble in solution of Chlor. Sodium, or, more precisely, in "40 parts of a concentrated sol. of Mur. Soda at 212°, from which it is again precipitated in fine red crystals on cooling." (E. P.) This serves to distinguish it from the Iodide of Mercury, which is insoluble in brine. It is remarkable for crystallizing in different forms according to the heat at which it has been sublimed, and also for the change of colour from yellow to red taking place upon merely touching the crystals with a hard body.

Prep. E. Rub together *Mercury* ℥ij. and *Iodine* ℥iiß., gradually adding a little Rectified Spirit, till a uniform red powder be obtained. Reduce the product to fine powder, dissolve it in solution of *Mur. Soda* Cong. j. with the aid of brisk ebullition. If necessary filter through calico, keeping the funnel hot. Wash and dry the crystals which form on cooling.
The D. C. prepare it by moist precipitation.

Mercury and Iodine being triturated together, the globules of the former quickly disappear, and heat is produced, and to an extent, if the quantities are considerable and the ingredients dry, sufficient to produce an explosion: hence Alcohol is added to keep the mixture moist. The Iodine, if moist, should be used in a proportionately larger quantity, or the mercury will be in less proportion than is necessary to produce the Biniodide, and some of the yellow Iodide will be produced. The E. C. therefore directs it to be purified by boiling in brine, (in which Hg I is insoluble), and crystallizing. The Biniodide may also be produced by acting on solutions either of Pernit. Mercury or of Bichlor. Mercury with sol. of Iod. Potassium, adding the latter by degrees, but only slightly in excess; as double decomposition taking place, the Biniodide precipitated is soluble in an excess of either of the salts employed in its production.

Tests. Most of these have already been given. (*v. supra.*) Dr. Pereira mentions in addition, that the presence of Bisulphuret of Mercury may be discovered by fusing it with caustic Potash, and then adding a mineral acid, when Hydrosul′ will be evolved. If heated in a crucible with Carb. Potash, metallic Mercury is sublimed, and K I is left behind, which may be recognised by its tests.

Action. Uses. Irritant Poison; Stimulant in scrofulous habits, but seldom employed. *Ext.* Caustic.

D. gr. $\frac{1}{16}$ to $\frac{1}{8}$ in pill or in Alcoholic solution.

Unguentum Hydrargyri Iodidi Rubri, D. Ointment of Biniodide of Mercury.

Prep. Triturate carefully *Red Iodide of Mercury* ʒj. with *Ointment of White Wax* ʒvij.

Use. A stimulant application to Ulcers.

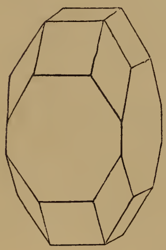
Hydrargyri Chloridum, L. Calomelas, E. D.

Chloride of Mercury. Calomel. Protochloride, *Submuriate*, and *Mild Muriate* of Mercury. *F.* Protochlorure de Mercure. Mercure doux. *G.* Einfach Chlorquecksilber.

The Chloride of Mercury ($Hg\,Cl=236$) occurs native in Carniola and in Spain, and is called Horn Mercury and Native Calomel; but it seems also to have been prepared artificially by the Hindoos at very early periods (Fleming and Ainslie), and prescribed by them internally. It has been known in Europe since 1608. Mr. Brande and Dr. Pereira consider the Eq. number of Mercury to be 100, so that for Hg in the above formula they substitute Hg_2. They thus consider Calomel to be really a Subchloride, and Corrosive Sublimate a Chloride of Mercury ($Hg\,Cl$). Apart from other objections to this change, the danger of a mistake between these two substances would alone render it unadvisable.

Prop. It is found crystallized in four-sided prisms terminated by four-sided pyramids. When prepared artificially, it may be obtained in similar quadrangular prisms covering a crystalline mass which is fibrous in texture, sparkling, semitransparent, somewhat horny, and elastic. (Brande.) Sp. Gr. 7·2. When scratched, a yellow characteristic streak is observed. As usually seen, it forms a heavy tasteless powder, of different degrees of fineness as well as of whiteness; of a light yellowish or buff-colour if obtained by levigation, but when condensed in air, a pure white and impalpable powder is formed. When sublimed into a small vessel it is horny and tough, retaining when powdered a yellow tinge. It becomes of a darker hue when exposed to light, and when heated, yellowish. At a higher degree of heat it sublimes. It is insoluble in pure water, Alcohol, and Ether. Boiled in water for some time, under the influence of alkaline Chlorides, a portion is dissolved. The alkalis and Lime-water instantly render it black, from precipitating the Protoxide and combining with its Chlorine. Chlorine converts it into Bichloride, as does boiling H Cl. Nitric or Sulphuric Acids convert half the Mercury into a Bichloride, and the other half into Nitrate or Sulphate of the Binoxide, $N\,O_4$ or $S\,O_2$, escaping at the same time. Solution of Protochlor. Tin precipitates metallic Mercury, the Tin taking the Chlorine. Calomel may also be reduced by heating with Carbonate of Soda. Comp. $Hg\ 85+Cl\ 15=100$.

Fig. 30.



Prep. L. Boil *Mercury* ℔ij. with *Sulph. Acid* f℥xxiß., until dry Bipersulphate of Mercury remains. Rub this again, when cool, with *Mercury* ℔ij. in a wedgewood mortar, until they are intimately mixed; then add *Chloride of Sodium* ℔iß., and triturate again until globules of Mercury are no longer visible. Then sublime. Reduce the sublimate to the finest powder, wash it repeatedly with boiling *Dist. Water*, and dry it.

E. D. Similar: but the E. C. add some Nitric′ to the Sulphuric, to aid in the oxidation of the Mercury.

In the first part of the L. process, 4 Eq. of Sulph. acid (Eq. 40) act upon 1 Eq. of Mercury (Eq. 200). 2 Eq. of the Sulph′ are decomposed into 2 of Sulphurous acid ($S\,O_2$), which escapes, and 2 of Oxygen. This Oxygen unites with Mercury, forming $Hg\,O_2$, and this Peroxide unites with the other 2 Eq. of $S\,O_3$, so that a Bisulphate of the Peroxide is produced.

$$Hg + 4\,S\,O_3 = Hg\,O_2,\,2\,S\,O_3 + 2\,S\,O_2.$$

Now if this Bipersulphate were sublimed at once with common salt ($Na\,Cl$), 2 Cl would replace 2 O, and the Bichloride of Mercury would be produced (q. v.). But, to obtain the Chloride, another Eq. of Mercury is first triturated with the Bipersulphate. The latter gives to the metallic Mercury 1 Eq. of Oxygen, and 1 of Sulph. acid, keeping itself the same quantity, so that 2 Eq. of the Sulphate of the Protoxide are formed.

$$Hg\,O_2,\,2\,S\,O_3 + Hg = 2\,(Hg\,O,\,S\,O_3).$$

When this Protosulphate is sublimed with Chlor. Sodium, the O and $S\,O_3$ unite with the Sodium to form Sulphate of Soda, and the Mercury combines with the Chlorine, forming Chloride of Mercury.

$$Hg\,O,\,S\,O_3, + Na\,Cl = Hg\,Cl + Na\,O,\,S\,O_3.$$

Along with the Chloride a little Mercury is apt to rise, and some Bichlor. Mercury or Corrosive Sublimate to be formed; or some Calomel in subliming may become separated into these two. The next part of the directions, that of washing, is intended to get rid of any Bichloride. This is best done by using cold distilled water, and gradually increasing its heat. The water of many springs, from containing various salts in solution, decomposes the Calomel. The Corrosive Sublimate being readily soluble, its presence will be detected in the water, either by Liq. Potassæ, which will cause a yellowish-red precipitate, or by Ammonia, which causes a white precipitate.

Some variations are often made in the latter part of the process, in order to obtain the Calomel of a white colour, and in the state of an impalpable powder. The first improvement was made by Mr. Jewell, who kept the vessel into which the Calomel was sublimed full of water or of steam, by which Jewell's patent Calomel and Howard's Hydro-sublimate or Hydro-Calomel was obtained. The apparatus was improved by Mr. Ossian Henry of Paris, and has been generally adopted, being admitted into the French Codex to produce the "Mercure doux

à la vapeur." Many English Chemists have, however, been in the habit of subliming the Calomel into a large chamber full of air. (P. J. ii. pp. 586 and 657.) M. Soubeiran has now adopted this method, having first proposed a current of cold air, as had been done by Mr. Dann of Stuttgardt.

Calomel may also be obtained in a state of fine division by precipitation, as in the old D. P., though the sublimed kind is preferred. This is called Scheele's Calomel, and by the French, Précipité blanc. It may be prepared by mixing solutions of Protonitrate of Mercury and Chloride of Sodium, and washing well the Calomel which is precipitated.

Dr. A. T. Thomson proposed to make both Calomel and Corrosive Sublimate in the most direct manner, by causing the vapours of Chlorine and Mercury to meet together and combine, in the proper atomic proportions.

Tests. Heat sublimes it without any residuum. It is a whitish powder, which, on the addition of Potash, becomes black, and then, when heated, runs into globules of Mercury. The distilled water with which it has been washed gives no precipitate with Nitr. Silver, Lime-water, or H S. (L.) If any Bichloride be dissolved, Nit. Silver will throw down Chlor. Silver, Lime-water yellowish Binoxide of Mercury, and Hydrosul′ a black Sulphuret of Mercury. Sulphuric Ether agitated with it, filtered, and then evaporated to dryness, leaves no crystalline residuum, and what residuum may be left is not turned yellow with Aqua Potassæ. (E.) Any Corrosive Sublimate will be dissolved by the Ether, and give a precipitate of the Binoxide of Mercury. The whitest Calomel is not necessarily fine in proportion, as some crystalline specimens are white, and the microscope reveals crystalline grains in other kinds of Calomel. White Precipitate (p. 213) mixed with Sulphate of Baryta has been sold on the Continent as Calomel, and also Sulphate of Baryta mixed with Calomel. (P. J. ii. 728.) That which is condensed in steam, or in a mass of cold air, is probably the best, and produces the effects of Calomel with most certainty.

Inc. Alkalis and their Carbonates, Lime-water, Alkaline Chlorides, Sal Ammoniac, Mineral acids, Metals and their Sulphurets.

Action. Uses. Alterative Stimulant, Sialogogue, Cathartic, &c., Antiphlogistic, Sedative. The sublimed Calomel is usually preferred, though the precipitated, from being finely subdivided, is an effective medicine.

D. gr. j. Alterative; gr. iij.—gr. v. Cathartic; gr. iij. with a little Opium, 2 or 3 times a day, will rapidly produce ptyalism; gr. x.—gr. xx. acts as a Sedative in particular cases.

Pilula Hydrargyri Chloridi Composita, L. Pilulæ Calomelanos Compositæ, E. D. *Pilulæ Plummeri.* Plummer's Pill.

Prep. L. Rub *Chlor. Mercury* and *Oxysulph. Antimony* āā ʒij. together; then with *Powdered Guiacum* ʒß. and *Treacle* fʒß., that a mass may be formed. E. Similar.

The D. C. use a small quantity of *Castor Oil* instead of *Treacle.* 1 grain of Calomel is contained in 6 grains of the L. and E. pills, and 1 in 5 of the D. P.

By long keeping these pills become partially decomposed, Sulphuret of Mercury and Chloride of Antimony being formed.

Action. Uses. Alterative and Diaphoretic in doses of grs. v.; Cathartic in grs. xx. Dr. Plummer said of his Pill, that it is in vain to look for its beneficial effects unless the materials are well levigated together, and for a considerable time.

Pilulæ Calomelanos et Opii, E.

Prep. Beat into a proper mass *Calomel* 3 parts, *Opium* 1 part, *Conserve of Red Roses* q. s. Divide into pills, each to contain 2 grs. Calomel.

Action. Uses. Diaphoretic and Antiphlogistic. A pill taken every 3 or 4 hours quickly produces ptyalism.

Unguentum Hydrargyri Chloridi. Calomel Ointment.

Calomel is often prescribed in the form of Ointment, and with great benefit in various forms of Cutaneous eruptions. "Pommade de Mercure doux" is made with 1 or 2 parts Calomel to 8 of Lard, to which some oil may be added. Dr. Pereira recommends ℨj. to ℥j. of Lard, and Dr. A. T. Thomson advises the addition of ℨiv. of Tar Ointment, as one of the best applications in Leprous and other dry and scaly skin diseases.

Hydrargyri Bichloridum, L. Sublimatus Corrosivus, E. Sublimatum Corrosivum, D.

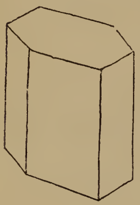
Bichloride of Mercury. Corrosive Sublimate. *Oxymuriate, and Corrosive Muriate of Mercury. F.* Deuto- and Bi-chlorure de Mercure. Sublimé Corrosif. *G.* Doppelt Chlorquecksilber.

Corrosive Sublimate has been long known to, and prepared by, the Hindoos, being their *ruskapoor* (Hind. Med. p. 45). It seems also to have been known to the Chinese, and it was prepared by Geber in the 8th century. It is largely manufactured for use both in medicine and the arts.

Prop. Bichloride of Mercury ($HgCl_2 = 272$) is white, with an acrid metallic and persistent taste, without smell. It is met with in small crystals, or in a semitransparent crystalline mass. Sp. Gr. about 5·2. It crystallizes in right rhombic prisms, sometimes terminated by converging planes. These are readily powdered, and effloresce at the angles when for some time exposed to the air. It is first fused

by heat, and then volatilized; is soluble in water, Alcohol, and Ether; requiring about three times its weight of boiling, and about 16 weights of cold water. Its solubility is much increased by the presence of Chlor. Sodium or Hydrochlor. Ammonia. (*v.* p. 212.) Alcohol dissolves about one-third of its weight, and Ether still more, so as to be employed sometimes in separating it from its aqueous solution and from organic bodies. When exposed to light in contact with organic substances, it is decomposed into Calomel and metallic Mercury. Nit′ and H Cl dissolve it without change. Potash, Soda, and Lime throw down the yellow Peroxide of Mercury, which afterwards becomes brick-red; and Ammonia causes a white precipitate (*v.* Hydr. Ammon. Chlorid. p. 213). The alkaline Carbonates precipitate a brick-red Carb. Mercury, Hydrosul′ throws down at first a greyish and then a black precipitate of Bisulphuret of Mercury; Ferrocy. Potassium a white Ferrocyanide of Mercury. Iod. Potassium causes a yellow precipitate, which becomes a bright red Biniodide of Mercury. Protochloride Tin, abstracting 1 Eq. of the Chlorine, becomes Perchlor. Tin in solution, while Calomel is precipitated; an excess abstracts more Chlorine, and metallic Mercury in a state of fine division is produced. So that this reagent causes at first a white, and then a black precipitate. Several of the metals, as Copper and Silver, decompose it, combining with the Chlorine and setting free the Mercury. Silver has lately been employed by Dr. Frampton. By triturating a grain of the Bichloride with several grs. of metallic Silver, a black powder is produced, and on heating this in the bulb of a small tube, a ring of metallic globules may be obtained. Mercury will combine with the second Eq. of Chlorine of the Bichloride, and convert it into the Chloride: this was one of the old methods for making Calomel. Gold, aided by Galvanic action, readily reduces it to a metallic state, and at the same time forms an amalgam. Thus by dropping the suspected liquor on a piece of polished Gold, or a sovereign, and touching the moistened surface with the point of a penknife, or, as Dr. Pereira suggests, applying a key, so that it may touch simultaneously the Gold and the solution, the Bichlor. becomes decomposed, and a Silver stain is left on the Gold. A galvanic circuit, which assists the reduction, is produced by the contact of the Gold and Steel. This is a delicate test. (Dr. Buckler has suggested the reduction of the Mercury to the metallic state within the stomach by means of Iron-filings and Gold-dust, both being in a state of very fine division.) The solution is known to contain Chlorine by the precipitate with Nit. Silver, insoluble in Nitric acid.

Fig. 31.



The action of vegetable and animal substances on Corrosive Sublimate is of considerable importance from the combinations which take

place in cases of poisoning. Most of the vegetable infusions and decoctions in use as medicines, as well as ordinary articles of diet, decompose it, especially when exposed to the action of light; the Bichloride also is decomposed when triturated with many fatty or volatile Oils; or boiled with Sugar; or it may combine with some of the vegetable principles, as in the process of Kyanizing wood. The Gluten of wheat acts with more energy, and more like animal principles. The greatest number of experiments have, however, been made with Albumen, into a solution of which, if a sol. of Corrosive Sublimate be dropped, a white flaky precipitate is thrown down, which, when dried, is hard, horny, and brittle. Ammonia rubbed up with this precipitate does not display any blackening, nor does Ac′ leave a white insoluble residuum, both tests showing that no Calomel had been formed. Lassaigne has some time since shown that the precipitate consists of 6·45 Bichloride of Mercury with 93·55 of Albumen, and that it is soluble in an excess of Albumen as well as of sol. of Bichloride of Mercury. It is generally supposed to be an inert and insoluble compound. It is probable that by other organic principles the Bichloride is simply deprived of half its Chlorine, Calomel being precipitated.

Bichlor. Mercury may be prepared by bringing together its constituents, or, as has been done by Dr. A. T. Thomson on a large scale, by passing Chlorine through Mercury heated to between 300° and 400°; and by other processes; but it is chiefly prepared by acting on the Bisulphate of Peroxide of Mercury with Na Cl.

Prep. L. Boil *Mercury* ℔ij. with *Sulph. Acid* f℥xxiß., until dry Bipersulphate of Mercury remains; rub this, when cool, with *Chlor. Sodium* ℔iß. in a porcelain mortar, then sublime with a gradually increasing heat.

E. D. Similar: the E. C. adding some Nitric Acid, as in the preparation of Calomel.

In this preparation a Bipersulphate is first made, as explained above (*vide* Chloride of Mercury); but no metallic Mercury is added, because what has been acted upon by the acid requires to be in the state of a Binoxide, in order that the Chlorine may combine with it in the same proportion. Thus as each Eq. of the Bipersulph. contains 2 Eqs. of Sul′ and 2 Eqs. of Oxygen combined with 1 Eq. of Mercury, it will require 2 Eqs. of the Chlor. Sodium to be decomposed in order that 2 Eqs. of Chlorine may be obtained to combine in the same proportion with the Eq. of Mercury set free, and form the Bichlor., which sublimes. The 2 Eqs. of Oxygen, of Sodium, and Sul′ set free, combining together, form 2 Eqs. of dry Sulph. Soda which remains behind.

$$Hg\,O_2, 2\,S\,O_3 + 2\,Na\,Cl = Hg\,Cl_2 + 2\,(Na\,O,\ S\,O_3).$$

Tests. The characteristics of Corrosive Sublimate having been fully given above, its purity may be ascertained by the following tests. It liquefies and sublimes entirely by heat. It is totally soluble in

water, and soluble in Rectified Spirit, and in Sulphuric Ether. (L. and E.) Fixed impurities will remain after sublimation. Calomel will not be dissolved by water. Five or six parts of Ether will remove the whole of the Bichloride. The other tests of the L. P. will show that it has been properly made. Whatever is thrown down from water, either by solution of Potash or Lime-water, is of a reddish colour, or if a sufficient quantity be added, it is yellow. Heated, this yellow substance emits Oxygen, and runs into globules of Mercury. (L.)

Inc. Alkalis and their Carbonates, Lime-water, Soap, Tartar Emetic, Nitr. Silver, the Acetates of Lead, Iodide of Potassium, Sulphuret of Potassium, many metals, infusions of bitter and astringent vegetables, as well as solutions of other vegetable and animal principles.

Action. Uses. Corrosive, Irritant Poison, in doses of a few grains, producing depression of the nervous system and excessive Mercurialism. In smaller doses, an excellent Alterative in Syphilis, secondary Syphilis, and chronic cutaneous diseases.

D. gr. $\frac{1}{16}$ to $\frac{1}{6}$, in a pill, or in the following solution. *Ext.* As a lotion, gr. $\frac{1}{2}$—gr. ij. in Aq. Dest. f℥j.

Liquor Hydrargyri Bichloridi, L. Solution of Bichloride of Mercury.

The Hydrochlorate of Ammonia is used to increase the solvent power of the water, which used to be effected by common Salt; but the Bichloride alone would dissolve in a much smaller proportion of water (*vide supra*), though not so readily.

Prep. Dissolve *Bichlor. Mercury* and *Hydrochlor. Ammonia* āā gr. x. in *Aq. dest.* Oj.

D. fʒß—fʒij. in some bland fluid. One fluid ounce contains $\frac{1}{2}$ gr. of Bichlor. Mercury.

Antidotes. Albumen, as in white of Eggs, followed immediately by infusion of Galls or of Catechu; Milk; Gluten of wheat and wheaten flour; Protosulphuret of Iron, if administered immediately, or within 15 minutes after the poison has become swallowed; Iron-filings (with Gold-dust?); Antiphlogistic treatment, as with other irritant poisons. Opium is useful to allay the symptoms. Of the chemical antidotes Albumen of Eggs is by far the best: the white of one Egg is sufficient to neutralize or render insoluble about 4 grs. of solid Bichlor. Mercury.

HYDRARGYRI AMMONIO-CHLORIDUM, L. D. Hydrarg. Precipitatum Album, E.

Ammonio-Chloride of Mercury. Amido-Chloride. White Precipitate. *F.* Chlorure Ammoniaco-Mercuriel insoluble. *G.* Weisser Quecksilber präcipitat.

This salt ($Hg, Cl, N H_2 = 252$) was discovered by Raymond Lully in the 13th century, and is formed by precipitating a solution of Bichloride of Mercury with Ammonia. It is met with in masses, or as a heavy white powder, without smell, but having a metallic taste; insoluble in Water and Alcohol; decomposed by heat, and resolved into Calomel, Ammonia, and Nitrogen; boiling water resolves it into Hydrochlor. Ammonia and yellow Binoxide of Mercury. Sul′, Nit′, and H Cl dissolve and at the same time decompose it. Sol. Caustic Potash, heated with it, expels Ammonia, forms and dissolves Chlor. Potassium, and leaves impure Binoxide of Mercury. Although there are differences of opinion as to the nature of this substance, the view of Sir R. Kane appears the simplest and the best, and has been generally adopted by Chemists.

Amidogen ($N H_2 = 16$) is a hypothetical radical, capable of combining with metals, like Oxygen, Chlorine, and Cyanogen, forming compounds called Amides. Now it seems that when Ammonia ($N H_3$) is added to a solution of $Hg Cl_2$, 1 Eq. of the former is decomposed into $N H_2$ and Hydrogen; then H takes Cl from the Bichloride, forming H Cl, which unites with a second Eq. of Ammonia. At the same time the $N H_2$ replaces the Cl, and forms a double salt, the Amido-Chloride of Mercury ($Hg, Cl, N H_2$), which is the insoluble White precipitate.

$$2 N H_3 + Hg Cl_2 = Hg, Cl, N H_2 + N H_3, H Cl.$$

Thus the salt is formed by the substitution by $N H_2$ (Amidogen) of half the Cl in Bichloride of Mercury. As stated above, the Amido-Chloride is decomposed by boiling in water, Binox. Mercury and Hydrochlor. Ammonia being produced.

$$Hg, Cl, N H_2 + 2 H O = Hg O_2 + N H_3, H Cl.$$

Prep. L. Dissolve *Bichlor. Mercury* ℥vj. in *Dist. Water* Ovj. with the aid of heat; when cool, add *Liq. Ammonia* f℥viij. frequently shaking; wash the precipitate until it be free from taste, and dry it. E. D. Similar.

The D. C. directs that it be washed until the water gives no precipitate with an acid solution of Nit. Silver, and then dried at a heat not exceeding 212°.

The changes here occurring have been already explained. The powder is washed to free it from Hydrochlor. Ammonia and Bichlor. Mercury.

Tests. Apt to be mixed with other white powders, as Carbs. Lime and Lead, Calomel, Starch, Sulph. Lime, and Sulph. Baryta. It

should be wholly evaporated by heat. It is soluble in H Cl without effervescence; (not if any Carb. is present). When digested with Acetic′, Iod. Potassium throws down nothing, either yellow (Iod. Lead), or blue (Iod. Starch). The powder rubbed with Lime-water, does not become black, (showing that no Calomel is present). When heated with solution of Potash, it becomes yellow, and emits Ammonia. (L.) No other white substance is known to do so.

Inc. Acids, Alkalis, acid and metallic Salts, &c.

Action. Uses. Supposed to be that of other Mercurials, as the Bichloride, but is only used externally.

UNGUENTUM HYDRARGYRI AMMONIO-CHLORIDI, L. Ung. Precipitati albi, E.

Prep. L. Add *Ammonio-Chloride Mercury* ʒij. to *Lard* ℥iij., and rub well together. E. Similar.

Action. Uses. Alterative Stimulant in Cutaneous diseases and indolent ulcers.

HYDRARGYRI BISULPHURETUM, L. E. Cinnabaris, D.

Bisulphuret and Red Sulphuret of Mercury. Cinnabar. *F.* Sulfure rouge de Mercure. *G.* Rothes Schwefelquecksilber.

Cinnabar was known to the Greeks. It has been discovered to be one of the pigments employed by the Egyptians. The Chinese as well as the Hindoos have from early times employed it as a medicine, and the former have long been celebrated for their *Vermilion.* It was formerly called *Kinnabari* and also *Minium*, being often confounded with the Red Oxide of Lead. It occurs native, both massive and crystallized, and is the principal ore from which the metal is extracted at Idria, Almaden, and in China. It is prepared artificially for use both in medicine and the arts.

Prop. The Bisulphuret of Mercury ($Hg\,S_2$=232), Sulphuret ($Hg\,S$) of some chemists, when in substance, is of a dark red colour, heavy, striated, giving a bright red streak when scratched; but when powdered is of a brilliant red, and commonly called *Vermilion.* Sp. Gr. 8·1. It is devoid of both taste and odour, is insoluble in water and Alcohol, and in most of the acids, and unalterable in the air. Heated, it becomes of a brownish-red; in the air, burns with a blue flame, yielding Sulphurous acid gas and metallic Mercury; but it sublimes unchanged out of access of the air. Heated with Potash, globules of Mercury are produced, and the addition of H Cl evolves Hydrosul′. It may be made by the following process:

Prep. L. Melt *Sulphur* ℥v. with *Mercury* ℔ij. Continue the heat till the mixture begins to swell up. Remove the vessel, cover it closely to prevent the mass taking fire; then pulverise, and sublime. E. Similar.

By the aid of heat, the ingredients combine, and would explode, if they were not covered and removed from the fire. A black Sulphuret is formed: by sublimation, it is obtained crystalline, and of a dark red colour, without any change of composition.

Tests. Sublimed entirely by heat, without any metallic globules being formed. Heated with Potash, it yields globules of Mercury; is not dissolved either by Nit′ or H Cl, but is soluble in Aqua Regia. Rectified Spirit with which it has been boiled is not reddened (showing absence of Dragon's-blood, &c.). Acetic′ digested upon it, yields no yellow precipitate with Iod. Potassium (showing that there is no Red Lead mixed with it). Red Sulphuret of Arsenic will be detected by the tests for Arsenic. (v. pp. 223 and 224.)

Action. Uses. Alterative, but seldom given internally. Still used by the Hindoos in fumigation; but the grey Oxide is preferable for such a purpose.

D. gr. x.—ʒß. For fumigation, ʒß.; but the Sulphurous vapours are irritating when inhaled.

Hydrargyri Sulphuretum cum Sulphure of the old L. P., was a black Protosulphuret with excess of Sulphur; also called *Ethiops Mineral.* It was made by rubbing together equal parts of Mercury and Sulphur, until globules were no longer visible. It is an inert preparation, now quite obsolete.

Hydrargyri Sulphas, D.

Bipersulphate of Mercury. Sulphate of the Protoxide, of some chemists. *F.* Deuto-Sulphate de Mercure. *G.* Schwefelsaures Quecksilberoxyd.

The Bipersulphate of Mercury ($Hg\ O_2, 2\ S\ O_3 = 296$) is officinal in the D. P. for pharmaceutic purposes; but though not separately mentioned in the L. and E. P., it is prepared in the first part of the processes for making both the Chlor. and Bichlor. Mercury (q. v.). It is a white crystalline salt, which is decomposed on being added to water, with the formation of a soluble acid sulphate, and the precipitation of an insoluble yellow Subsulphate of Mercury (which used to be officinal in the D. P.).

Prep. Heat *commercial Quicksilver* ℥x. in a porcelain capsule, with *Sulph. Acid* f℥vj., until effervescence ceases, and nothing remains but a dry crystalline salt.

This corresponds to the first part of the process for making Calomel and Corrosive Sublimate. 2 Eq. of $S\ O_3$ are decomposed into 2 of Sulphurous acid, which escapes, and 2 of Oxygen, which combine with 1 Eq. of Mercury. The Binox. Mercury thus formed unites with 2 more Eq. of $S\ O_3$ to form the Bipersulphate with the above formula. Sulphuric acid does not act on Mercury in the cold.

Action. Uses. Would no doubt act as other Mercurials, but is officinal for making Hydrargyri Chloridum and Bichloridum.

Liquor Hydrargyri Pernitratis, D. Solution of Pernitrate of Mercury.

Prep. Dissolve *pure Mercury* ℥ij. in *pure Nitric′* f℥iß., first diluted with *Dist. Water* f℥iß., with the aid of heat; and evaporate the solution to the bulk of f℥iiß.

When these proportions are adopted, and heat employed, the Hg is oxidized into $Hg\,O_2$ at the expense of a portion of the Nitric′; and this combines with some more Nit. Acid, forming a Nitrate of the Binoxide of Mercury ($Hg\,O_2$, $N\,O_5 = 270$). By the addition of much water this salt is decomposed into a soluble Supernitrate, and an insoluble Subnitrate.

Action. Use. A caustic application, highly esteemed in France.

Unguentum Hydrargyri Nitratis, L. Ung. Citrinum, E. Ung. Hydr. Nitratis vel Ung. Citrinum, D. Citrine Ointment.

Citrine Ointment, or Ointment of the Nitrate of Mercury, is a much-used and highly valued preparation, which was introduced into the Pharmacopœias as a substitute for one known as Golden Eye Ointment. When properly prepared, it is soft, of a bright yellow or lemon-colour, and of a strong Nitrous odour. It is sometimes apt to change, especially if the directions for its preparation are not strictly followed. It becomes then hard, brittle, and almost pulverulent, and its colour changes to bluish-grey, greenish, or mottled, the metal becoming by degrees reduced.

Prep. L. Dissolve *Mercury* ℥ij. in *Nitric′* f℥iv.; then mix the liquor while hot with *Lard* ℔j., and *Olive Oil* f℥viij., first melted together.

E. Proportions, *Mercury* ℥iv. with *pure Nitric′* f℥viij., ʒvij. A gentle heat is ordered during the mixing, which is to be increased if effervescence does not take place.

D. *Pure Mercury* ℥j. to *Nitric′* f℥j., diluted first with *Dist. Water* ʒß. Directions similar to E. P.

In the L. P. of 1836 the proportion of Mercury to acid was ℥j. to fʒxj. Much difficulty was then experienced in making, and still more in preserving the ointment. Contact with steel, with other ointments, &c., was sufficient to deoxidize and precipitate the Mercury. Mere exposure to the air was frequently enough to effect this change, the ointment becoming dark and pulverulent, as above described. The use of other oils was recommended by some. Others, as Mr. Alsop (P. J.: I. 100), advised the employment of a heat of about 190°; and it was further found that the use of more Nitric acid tended to prevent the change.

Thus the proportion of Nitric′ in the directions of the L. P. has been much increased; it now more resembles the formula of the E. P.; while the quantity ordered in the D. P. is still much too small.

It has been shown that a Nitrate of the Protoxide of Mercury is formed by the employment of dilute acid in the preparation of the Nitrico-oxide; and that by employing a larger proportion of a stronger acid, as in a formula of the D. C., a higher state of oxidation is induced, and a Nitrate of the Peroxide made.

But in the formula given above, a still larger proportion of strong acid is used, and a Binitrate of the Peroxide, or a Bipernitrate (analogous to the Bipersulphate), is obtained; ($Hg\,O_2, 2\,N\,O_5 = 324$). It seems that 2 Eq. of $N\,O_5$ part with 2 O, and produce 2 of Nitrous acid ($N\,O_4$). The 2 Eq. of Oxygen unite with the Mercury, and the Binoxide produced combines with 2 more Eq. of Nitric′, forming the Bipernitrate.

$$Hg + 4\,N\,O_5 = Hg\,O_2, 2\,N\,O_5 + 2\,N\,O_4.$$

When a smaller quantity of Nit′ is used, $N\,O_2$ is formed, instead of $N\,O_4$. With the L. proportions, some excess of Nitric acid still remains. The solution containing the Mercury is now mixed with the melted lard and oil. Two important changes take place in these fatty matters.

(1.) *Elaidine is formed.* Both lard and oil contain Oleine, a liquid fat, consisting of Oleic acid combined with Glycerine. By the action of Nitrous acid, Oleic acid is converted into Elaidic acid, which is much more solid, but said to be isomeric with it ($C_{36}\,H_{34}, O_4$). This acid, combined with Glycerine, forms Elaidine; but when there is a deficiency of Nitric′, some of it combines with Hg, forming Elaidate of Mercury, while Glycerine is set free. (*v.* Boudet, in J. de Chim. Med. viii.)

(2.) *Some portion of the fatty matter undergoes oxidation.* This is the second change. By the action of the Nitric′, which remains in excess, some of the fat is oxidized into a red viscid oil, which is soluble in Alcohol, but the composition of which is ill understood. It is this oil which gives to the ointment, when well prepared, its pure yellow colour. During these changes effervescence takes place; from the escape of Binoxide of Nitrogen, Nitrous acid, and some Nitric′ which remains undecomposed. Soubeiran states that Carb. acid gas is evolved at the same time, but this has been questioned.

The ointment thus prepared should be soft, of a bright yellow colour, and should not become hard or changed in colour by keeping.

(The proportions in the E. P. are those recommended by Dr. Duncan in his *Dispensatory*, 1794. They were originally proposed by Mr. Duncan, of Edinburgh. Dr. Christison advises to use a still larger quantity of the acid than is there ordered.)

Action. Uses. Stimulant and Alterative application to the eyelids in chronic Ophthalmia, also in several cutaneous eruptions, and to foul and indolent ulcers. If long applied, it will produce the effects of a Mercurial on the system. When decomposition has taken place, it ought not to be applied, as it then becomes extremely irritant.

UNGUENTUM HYDRARGYRI NITRATIS MITIUS, L. Milder ointment of Nitrate of Mercury.

Prep. Rub together *Ointment of Nit. Mercury* ℥j. and *Lard* ℥vij. It is to be used freshly prepared.

Use. As an eye-salve in many cases, when the last is likely to irritate.

LINIMENTUM HYDRARGYRI NITRATIS, made with *Ung. Hydr. Nitr.* ℥ijß., *Cerati Simplicis* ℥vijß., *Olive Oil* f℥v., is used in the Manchester Infirmary.

HYDRARGYRI ACETAS.

Acetate (of Protoxide) of Mercury. *F.* Protoacetate de Mercure. *G.* Essigsaures Quecksilberoxydul.

The Acetate of Mercury (Hg O, Ac′=259) has been long known to chemists, but was introduced into practice in consequence of the French Government having, in the middle of the last century, purchased the secret of *Keyser's pills*, which were vaunted as an antisyphilitic remedy. Some supposed that he employed a mixture of the Acetates of the Protoxide and of the Peroxide of Mercury, and others that he employed the latter only. It was contained in the old D. P. but is now omitted.

Prop. It occurs in thin scale-like crystals, flexible, white in colour, without odour, but having an acrid metallic taste. Sparingly soluble in cold, and partially decomposed by boiling water, as it is also by boiling Alcohol. Light also decomposes and blackens it. Heat resolves it into Acet′ and Carb′ and Mercury. Sul′ disengages the odour of Ac′, and the alkalis precipitate the Black Oxide of Mercury from its solutions, while from that of the Acetate of the Peroxide a yellow precipitate takes place. Comp. Hg O 80·66+Ac′ 19·34=100.

Prep. It may be made by mixing hot solutions of Protonitrate of Mercury and Acetate of Potash. Double decomposition takes place, and the Protacetate of Mercury, being comparatively insoluble, crystallizes out as the solution cools.

Action. Uses. Considered a mild Mercurial, but has occasionally acted with violence, in consequence probably of being badly prepared, or of having afterwards altered in composition.

D. gr. j.—grs. v.

HYDRARGYRI BICYANIDUM.

Bicyanide of Mercury. *F.* Cyanure de Mercure. *G.* Doppelt-Cyanquecksilber.

Bicyanide of Mercury (Hg 2 Cy=252) was discovered by Scheele. It was introduced into the D. P. for making Hydrocyanic acid. It is

not now officinal in any of the Pharmacopœias. It is of a dull white colour, without smell, but of a disagreeable metallic taste. Crystallized in anhydrous obliquely truncated four-sided prisms: permanent in the air, partially dissolved by Alcohol, soluble in 8 times their weight of temperate, but much less of boiling water. It is dissolved by Nit′, but decomposed by Sul′ and by Hydrosul′, the latter precipitating a black Sulphuret of Mercury from its solution. H Cl disengages from its solution Hydrocyanic′, which is known by its peculiar smell. A glass rod moistened with the sol. of Nitr. Silver, and held over it, acquires a deposit (Cyanide of Silver) soluble in boiling Nit′. Heated, it emits Cyanogen, and globules of Mercury are obtained. Comp. Hg. 79·6+Cy 20·4=100.

Prep. It may be prepared by saturating the officinal dilute Hydrocyanic Acid with Binoxide of Mercury, and evaporating that crystals may form.

Action. Uses. Irritant Poison. Sometimes used as a substitute for Corrosive Sublimate, which it resembles in action. Used also to prepare the next salt.

D. gr. $\frac{1}{16}$ gradually increased to gr. $\frac{1}{2}$, in pills or in solution.

POTASSII ET HYDRARGYRI IODO-CYANIDUM, L. Iodo-Cyanide of Potassium and Mercury.

This salt is precipitated in minute crystals when concentrated solutions of Iodide of Potassium and Bicyanide of Mercury are mixed together. It is a double salt, composed of single equivalents of each of these. ($KI+HgCy_2=418$). It is soluble in about 16 parts of water at 60°. It was introduced by Professor Geoghegan of Dublin as a test to detect the presence of mineral acids in dilute Hydrocyanic′; and has been adopted for this purpose by the L. C.

All soluble salts of Mercury, except the Bicyanide, are decomposed by Iod. Potassium, Iodide or Biniodide of Mercury being formed.

Hydrocyanic′ itself cannot decompose the Bicyanide of Mercury; but any other acid will do so. Thus if, for example, Sulph. or Hydrochlor. acid be present in the dilute H Cy, and this salt be added to it, the Bicyanide is immediately decomposed, and the red Biniodide precipitated by the action of K I on the Sulphate or Bichloride of Mercury. (*v.* Hydrocyanic acid.)

ARSENICUM.

Arsenic. *F.* Arsenic. *G.* Arsenik.

The name Arsenic is ambiguous even in modern times, being applied sometimes to the metal, and sometimes to one of the compounds which this forms with Oxygen (white Arsenic, or Arsenious acid). The same ambiguity occurs in old works; for the name Arsenikon (*αρσενικον*) is applied by Dioscorides to the yellow Sulphuret, while the

red Sulphuret is distinguished by the name Sandarach (σανδαραχα). The Arabs call the former *zurneekh zurd* (yellow), and the second *zurneekh soorkh* (red). The name *zurneekh* is supposed by Sprengel to be a corruption of Arsenicon, but of this there is no proof. The Arabs were also acquainted with the white Oxide, which they called *sum-al-far*, *mouse-poison*, or Ratsbane, and also *shook*, *turab-al-hulk*, and *turab-al-kai*, windpipe-earth, and emetic-earth. The Hindoos are well acquainted with all three substances; Orpiment being their *hurtal*, Realgar their *mansil*, while white Arsenic they call *sanchya*. They were probably the first to prescribe it internally, as in Leprosy (Prof. H. H. Wilson), which they still do, both in that complaint and in intermittent fevers. Metallic Arsenic was first distinctly made known in Europe by Brandt, in 1733. Geber seems to have been acquainted with it.

Arsenic ($As = 75$) is sometimes found native in a metallic state, but it is most extensively diffused in combination with other metals, as in the Arseniurets of Iron, Nickel, Copper, Cobalt, &c. It is separated from these metals by roasting in a reverberatory furnace, and collecting what is sublimed in a long horizontal chimney, or into one divided into numerous compartments. By this process of roasting the metallic Arsenic is separated and oxidized, being converted into Arsenious acid ($As\,O_3$). This, being procured in an impure state, is first purified by sublimation, and then heated with Charcoal, which abstracts the Oxygen, and reduces the Arsenic to its metallic state, and enables it to be separated by sublimation.

Arsenicum Purum, D., is prepared by covering Arsenious acid with Charcoal, in a German glass tube, and subliming the metal into the cool or distant end of the same tube.

Prop. Metallic Arsenic is of a steel-grey colour, has a metallic lustre, is crystalline in texture, and very brittle. Sp. Gr. 5·8. Heated in close vessels, it readily sublimes at a low red heat, and is again deposited in a bright metallic crust, shining like polished steel. Its vapour is remarkable for having a strong smell of garlic. Exposed to the air, it tarnishes, and becomes encrusted with a grey powder, which is an imperfect Oxide, or a mixture of Arsenious acid and metallic Arsenic. It is well known on the Continent as *fly-powder*. It is readily oxidated also in water, and even in Alcohol. Heated in the air, Arsenic easily burns, producing white fumes, which are sometimes called Flowers of Arsenic, but are those of the white Oxide, that is, of Arsenious acid. q. v.

Arsenic is an acidifiable metal, *i.e.*, it tends to form with Oxygen acids, and not bases. By its combination with Oxygen two distinct acids are formed:—1. Arsenious acid (which is officinal), $As\,O_3$. 2. Arsenic acid, $As\,O_5$.

Acidum Arseniosum, L. Acidum Arseniosum Purum, D. Arsenicum album, E.

Arsenious acid. White Oxide of Arsenic. White Arsenic. *F.* Arsenic blanc. *G.* Weisser Arsenic. Arsenichtesaure.

The substance commonly called white Arsenic has been long known. (*v.* supra.) It is found native, but is almost entirely obtained for use from the refuse ores of different metals, in which Arsenic is contained, chiefly in Bohemia and Saxony, but also in Cornwall.

It is prepared in Silesia and in Cornwall by roasting in a muffled furnace Mispickel, or Arsenical Iron Pyrites. As being oxidized, as stated above, $As\,O_3$ sublimes, and Sulphuret of Iron is left behind. The product is purified by a second sublimation in Iron vessels with conical heads. It is then sufficiently pure, and rarely needs a further sublimation, though this is ordered by the D. C.

Arsenious acid ($As\,O_3=99$), called also Oxide, and sometimes Sesquioxide or Teroxide of Arsenic, is colourless, with scarcely any taste, or, after a short time, a very faint sweetish taste,* and devoid of smell both in its solid and vaporous state. It is found in commerce in masses, which, when recently prepared, are transparent and glassy, but in time become opaline and even opaque; often on breaking a piece which has become so, the interior will be observed still to have a vitreous and transparent appearance, but the fresh surface soon becomes like the exposed parts, brittle and pulverulent. It may be crystallized in regular octohedrons, on cooling a saturated solution obtained by boiling in water and evaporating, or by careful sublimation. The change in appearance from transparency to enamel-like opacity, is by some ascribed to mere difference of molecular arrangement. The opacity Mr. Philips believes to be owing to the absorption of water from the atmosphere. These varieties differ from each other in density, the opaque having a less degree of specific gravity than the transparent variety, as ascertained by Messrs. Guibourt, Phillips, and Taylor, whose observations are as follows :

	Transparent.	Opaque.
M. Guibourt	3·7391	3·695.
Mr. Phillips	3·715	3·620.
Mr. A. Taylor	3·798	3·529.

* It is often differently described; as "acrid, nauseux," even by Soubeiran. Orfila likewise, as quoted by Dr. C., describes it as a rough, not corrosive, slightly styptic taste—persistent and attended with salivation. Dr. Christison and his friends in making experiments on it, "all agreed that it had scarcely any taste at all,—perhaps towards the close a very faint sweetish taste." So Dr. A. T. Thomson, Mr. A. Taylor, Mr. R. Phillips. There is little doubt but that in some cases the subsequent effects produced by the irritation of the poison have been confounded with the primary taste.

The solubility in water also of these varieties was said to differ by M. Guibourt, who found the transparent dissolved in 103 parts of water at (15° Cent.) 59° F., and in 9·33 parts of boiling water; and that the opaque variety dissolved in 80 parts of cold water at the same temperature, and in 7·72 parts of boiling water. Mr. Taylor (Guy's Hosp. Reports, vol. iv. p. 83), observing the great discrepancies in the statements of chemists respecting the solubility of Arsenic in water, submitted it to careful experiment; and he states that there is no observable difference in the solubility of the transparent and opaque varieties of Arsenious acid; that water at ordinary temperatures dissolves about $\frac{1}{1000}$ or $\frac{1}{500}$ of its weight, according to circumstances; that hot water at 212°, allowed to cool on it, dissolves less than $\frac{1}{400}$ of its weight, or about $1\frac{1}{4}$ grs. to each f℥; but that water boiled for an hour on Arsenious acid dissolves $\frac{1}{24}$ of its weight, or rather more than 20 grs. to each f℥.; and that this water, on perfect cooling, does not retain more than $\frac{1}{40}$ of its weight, or 12 grs. to the f℥. It is observed as remarkable that the quantity retained in a cold saturated solution prepared by boiling water should be so much greater (that is, 10 to 20 times more) than what cold water can dissolve, or even hot water without the continued boiling. He further confirmed what had been ascertained by Dr. Christison, that though the presence of organic matter in a liquid is an obstacle to the solution of the poison, yet that viscid liquids, as gruel, may suspend a larger quantity than they can dissolve. Hence in searching for Arsenic in organic liquids, or in the stomach or intestines in cases of poisoning, it is proper first to dilute the liquid considerably with water, and, secondly, to boil the liquid thus diluted for 2 or 3 hours. The solution faintly reddens Litmus. Arsenious acid is soluble in Oil, also in Alcohol, which dissolves about 2 grs., (but cold Brandy not above 1 gr.) in the ounce. When subjected to heat, Arsenious acid is volatilized at a temperature of about 380°, but without the characteristic smell of metallic Arsenic, and is again deposited in sparkling octohedral crystals. If heated under the pressure of its own atmosphere, it melts and is transformed into a glassy-looking substance; but if heated with any Carbonaceous matter, it becomes decomposed, from the Carbon abstracting its Oxygen and setting free the Arsenic, which being itself volatilized, will exhale a garlicky odour. It may be dissolved without change in some acids, but when heated with Nitric′ the latter is decomposed, and the Arsenious acid, by taking some of its Oxygen, is converted into Arsenic acid. It readily combines with Potash and Soda, forming soluble salts, and also with Lime and some metallic Oxides, forming insoluble and characteristic compounds, which will be noticed among the Tests. Comp. As 75·72+O 24·21 =100.

Tests. L. P. "Arsenious acid is white, or faintly yellow, and for the most part opaque; but sometimes, when freshly broken, more or less translucent. Heated in a glass tube, it is sublimed of a white colour; but when cool, it appears in octohedral crystals free from

colour. Mixed with Charcoal and exposed to heat, it is reduced to Arsenic, and sublimes, exhaling an alliaceous odour; and when cool, adheres to the tube, having a metallic lustre. It is soluble in boiling water; which deposits it on cooling in octohedral crystals. H S being added to this solution, a yellow substance is thrown down; Ammonia, and afterwards Nit. Silver, being added, there is a lemon-coloured precipitate; and Potash, with Sulphate of Copper, a green precipitate. If 100 grains of this acid be boiled in dilute H Cl, and H S added when the solution is cool, 124 grains of Sulphuret of Arsenic are precipitated."

As Arsenic and most of its compounds are poisonous, and frequently employed both by suicides and murderers, it is necessary to be able to detect their presence. In suspected cases, any powder adhering to the coats of the stomach, or left in the vessels employed, is to be searched for and kept apart; the stomach and its contents may be boiled in distilled water; or the poison may be searched for in the blood and solids of the body; as it is not found in these or the bones naturally, as was at one time thought by Orfila. We may therefore have to treat it as a solid substance, or in the state of solution, either pure or intermixed with organic matters. We may often get a ready indication of the presence of Arsenic by the process of Reinsch, that is by boiling a small quantity of the suspected matter with Copper and Muriatic acid, when metallic Arsenic, if present, will be deposited on the Copper, which will appear as if covered with a thin coating of steel.

It will be convenient, in shortly considering the tests for Arsenious acid, to arrange them under nine heads. There are three *dry tests* which may be applied to the acid when obtained in a solid state; and six *liquid tests*, by which it may further be recognized when obtained in solution. The dry tests are as follows:—

1. *Sublimation Test.*—If Arsenious acid be heated alone in a narrow glass tube, it is entirely sublimed, and is deposited inside in a cooler part of the tube in small octohedral crystals.

2. *Reduction Test.*—The most satisfactory and convenient test, and one delicate enough for medico-legal purposes, is the reduction of the Arsenious acid to the metallic state, by heating it with Charcoal. It may be performed, when the quantity is small, with Charcoal in a glass tube, which need not be above the $\frac{1}{8}$ of an inch in diameter. But when the quantity of poison is larger, it is preferable to use a Soda flux.* Heat the Arsenious acid and flux in the flame of a spirit-lamp, applied first to the upper part and then to the bottom of the tube. A little water escapes, and should be removed with a roll of filtering-paper, and then, holding the tube steadily in the flame, the

* Dr. C. recommends grinding crystals of Carbonate of Soda with $\frac{1}{8}$ of their weight of charcoal, and then heating the mixture gradually to redness. Mr. Taylor recommends neutralizing a solution of Tar' with a solution of Carb. Soda, evaporating to dryness and incinerating in a closed platinum crucible.

heat should be raised so as to sublime the metal; it will then be obtained in a brilliant crust, and distinct, even when weighing only the 300th of a grain. When much metal is sublimed, an alliaceous (garlicky) odour will be perceived.

3. *Re-oxidation Test.*—A further proof that the metal is Arsenic, is afforded by the greyish-white combined with a crystalline appearance, observable in the cooler parts of the same tube, and which may be further produced, as originally suggested by Dr. Turner, by converting the crust, or a portion of it, into Arsenious acid, by chasing it up and down the tube with a small spirit-lamp flame, till it is all converted into a white powder, among which the sparkling triangular facets of the octohedral crystals of Arsenious acid will be seen with the naked eye, or with a glass of four powers. This crystalline powder may be dissolved in a few drops of distilled water; or else, filing off the part containing the sublimate, boil the tube and its contents in another tube, and then apply the following tests.

When a clear solution in distilled water can be obtained, Arsenious acid may be detected by the liquid tests:

1. *Lime-water Test.*—Lime-water, when added to such a solution, gives a white precipitate of Arsenite of Lime; but there must not be any excess of acid, or any free alkali present. This test is, however, so indecisive, that it has been abandoned by Toxicologists.

2. *Ammonio-Nitrate of Silver Test.*—Nitrate of Silver, dissolved in 10 parts of water, does not by itself occasion any precipitate; but if a little alkali, such as Ammonia, be first added to the solution of the Nitrate, forming an Ammonio-Nitrate of Silver, a lemon-yellow precipitate (becoming brown in the light) immediately takes place of the Arsenite of Silver,—Nitrate of Ammonia remaining in solution. As the precipitate is soluble in Ammonia, and also in Nitrate of Ammonia, it is necessary to be careful in preparing this test. The directions of the E. C. should be followed, the Ammonia being added cautiously, so as nearly, but not quite, to dissolve the oxide first thrown down. If there should be too little Ammonia, the test would precipitate solutions of Phosphoric acid; if too much, the Arsenite of Silver would be redissolved by it.

3. *Ammonio-Sulphate of Copper Test.*—This test is prepared in the same way as the last. Arsenious acid is not precipitated by a solution of Sulphate of Copper unless an alkali be present. For this the L. C. employ Potash, but Ammonia is generally used. By adding just enough Ammonia to redissolve the Oxide of Copper first precipitated, a solution of Ammonio-Sulphate of Copper (q. v.) is obtained. When this is added to an Arsenious solution, a grass-green precipitate of Arsenite of Copper takes place. Mr. Taylor (Guy's Hospital Rep. No. xiii.) has recommended this precipitate to be washed, collected, and dried, and then a small quantity of it, finely powdered, to be introduced into a minute tube, and very gently and carefully

heated over the flame of a spirit-lamp, when a ring of small octohedral crystals of Arsenious acid will appear.

4. *Sulphuretted Hydrogen Test.*—When *Sulphuretted Hydrogen* or *Hydrosulphuric acid* is passed through a solution of Arsenious acid, which has been previously acidified with a few drops of H Cl, a bright yellow precipitate takes place of Tersulphuret of Arsenic (Orpiment), which is soluble in Liq. Ammoniæ. The Oxygen of the Arsenious acid and the Hydrogen of the H S unite to form water. Excess of Hydrosulphuric′ (which should have been passed through a double-necked bottle holding water) must be got rid of by heat. Hydrosulphate of Ammonia is sometimes employed, with the addition afterwards of a few drops of acid to neutralize the Ammonia, but is objectionable except as a trial test.

This test is usually preferred to all the others, and is so delicate as to indicate Arsenious′ in 100,000 parts of water; indeed, Dr. Fresenius (Lancet, June & July, 1844) would almost rely on it exclusively; and it has the advantage of always acting. The precipitate may be finally heated with black flux or dry Carb. of Soda and Charcoal in a small tube, when the Arsenic will be deposited as a metallic crust, and may be reconverted into octohedral crystals of Arsenious acid, and thus enable the above to be distinguished from other yellow precipitates.

The three last tests, when they are characteristically developed, and concur, are considered by Dr. Christison to afford unimpeachable evidence of the presence of Arsenic; the more so, as the precipitates may be submitted to the demonstrative proof of reduction.

5. *Reinsch's Test.*—A new process for detecting the presence of Arsenious acid has been discovered by H. Reinsch, and fully reported on by Mr. A. Taylor in Brit. and For. Med. Rev. No. xxxi. If Copper foil cut into pieces about an inch long and $\frac{1}{8}$ of an inch in width, or some fine Copper gauze, be boiled for a short time with a little (about $\frac{1}{10}$) of pure Hydrochlor. acid in a solution containing Arsenious acid, this becomes decomposed, a thin steel-like coating of metallic Arsenic is deposited on the Copper, and may be separated from it again by dissolving it off with Nitric acid, or by heating in a tube, when it will sublime in the form either of a ring of the metal, or as sparkling crystals of Arsenious acid. These may be dissolved in a little distilled water, and the liquid tests applied, if thought necessary. This process has the advantage of being readily applied, and is so delicate as to detect $\frac{1}{200000}$, or even $\frac{1}{250000}$ part of Arsenic, and so effectual, that Marsh's process fails to show the smallest trace of Arsenic in the residuary liquid. This process is not to be regarded so much as a *Test*, but as a ready means of separating the Arsenic from a solution, so that other tests may be applied to it when so separated.

6. *Marsh's Test.*—A very delicate process, suggested by Mr. Marsh, of Woolwich, has been generally employed since its inven-

tion. This depends upon the power of nascent hydrogen to deoxidize Arsenious acid. Of this the metal combining with the Hydrogen, passes off in the form of Arseniuretted Hydrogen gas, which may be burned so as to obtain the Arsenic in a metallic state, or as Arsenious acid; or may be fixed by being passed into solutions of some of the liquid tests.

The suspected liquor is introduced into a suitable apparatus with pieces of Zinc and some Dil. Sulphuric acid. Water being decomposed, Hydrogen escapes, along with some Arseniuretted Hydrogen gas ($As\,H_3$), if any Arsenic is present. If these two gases are burned at the end of a fine pointed tube, and a piece of glass or of porcelain introduced into the flame, metallic Arsenic of a blackish colour will be deposited upon it (and may be dissolved off with Nitro-hydrochloric′); but if the porcelain be held above the flame, then Arsenious acid in a white crust will be deposited; or both deposits may be obtained by holding above the flame the open end of a tube $\frac{1}{4}$—$\frac{1}{2}$ inch in diameter and 10 inches in length. (Per.) We may obtain a solution of the acid by holding mica, moistened with a few drops of water, over the flame (Herepath, Med. Gaz. xviii. p. 889); or the gas may be passed into a solution of Nitrate of Silver, as proposed by Dr. Clark. The explanation of this test is simple. In the first place the Arsenious′ is deoxidized by the action of nascent Hydrogen, produced by the action of Sulph. acid on Zinc. Arseniuretted Hydrogen and water are formed.

$$As\,O_3 + 6\,H = As\,H_3 + 3\,H\,O.$$

$As\,H_3$ is then burnt; and in the centre of the flame, the combustion being there imperfect, H only is oxidized, As remaining free, so that the latter may be obtained on a piece of porcelain.

$$As\,H_3 + 3\,O = As + 3\,H\,O.$$

At the end of the flame the combustion is complete, As being converted into $As\,O_3$. This also may be condensed and tested. When the unburned gas is passed into the solution of Nit. Silver, the Oxide of Silver is deprived of its oxygen, which combines with the As of the $As\,H_3$ to form Arsenious acid, and with the H to form water. Metallic Silver is precipitated as a black powder, and Nitric and Arsenious acids left in solution. The solution may be tested for the latter.

When Arsenious acid is mixed with organic substances, as is usually the case in cases of poisoning, some difficulties are necessarily experienced. These, and the fallacies attending the use of the respective tests, are fully explained and provided for in works expressly devoted to the subject. The processes of Reinsch and of Marsh, or that with Hydrosulphuric acid, are to be employed with the necessary precautions, and among them it must never be forgotten that some of the substances employed as tests (such as Sulphuric′, Zinc, &c.)

are apt to be themselves adulterated with Arsenic. (*v.* Christison on Poisons, 3rd and 4th Ed.; Mr. Taylor's Papers and Reports in the Brit. and For. Med. Review; Pereira's Materia Medica.)

Fig. 32.*

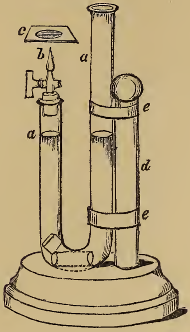


Fig. 33.†

Action. Uses. Irritant Poison, Antiperiodic, Alterative. *Ext.* Occasionally employed as a Caustic in Cancers and Cancer-like affections.

D. gr. $\frac{1}{16}$ or $\frac{1}{12}$ to $\frac{1}{8}$. Rub up gr. j. with Sugar grs. x., and make into pills with crumb of bread, and divide into 16 pills. The Hindoos usually prescribe it in a solid state with pepper, &c. But it is generally prescribed in the form of Liq. Potassæ Arsenitis.

Antidotes. Evacuate Stomach. Encourage vomiting by mechanical irritation, prescribe an emetic of Sulph. of Zinc, or use the stomach-pump. Give frequent draughts of milk both before and after vomiting has begun (though not in large quantities), or demulcent or farinaceous decoctions. Large quantities of Magnesia and of Charcoal have been useful in some cases; but the most effectual antidote is the Hydrated Sesquioxide of Iron, or Ferrugo of the E. P. (*v.* p. 141); it must be given in large quantities, and, as ascertained by Dr. Maclagan, in the proportion of 12 parts of the Oxide, in a moist state, to 1

* Marsh's apparatus. *a. a.* Bent tube containing suspected fluid, Sul′, and Zinc.
b. Stop-cock and jet.
c. Plate of glass to receive the Arsenic.
d. e. Supports.

† Reducing tube. *b.* Charcoal and Arsenic. *a.* Metallic stain. The gas may be passed through a long horizontal tube, made of hard glass, and metallic Arsenic reduced by simply applying the flame of a spirit lamp.

of Arsenic; a spoonful of this moist oxide may be given every 5 or 10 minutes, and Reinsch's test employed upon the vomited matters, to ascertain the progress of the case. When the poison has been removed from the stomach, arrest inflammation by venesection, promote diuresis, support the strength with Opium, and administer occasional doses of Castor Oil.*

Liquor Potassæ Arsenitis, L. Liquor Arsenicalis, E. D. *Fowler's Solution.* Tasteless Ague Drop.

Prep. L. Boil *Arsenious Acid* broken in small pieces, and *Carbonate of Potash,* āā gr. lxxx. in *Aq. dest.* O ß. till they are dissolved. When cold, add *Compound Tincture of Lavender* f ʒv. and then add *Aq. dest.* q. s. to fill accurately a pint measure. E. Same proportions.
D. 82 grs. of each are used.

When the Arsenious acid and Carbonate of Potash are boiled together, the Carbonic′ is expelled, the Arsenious acid combines with the Potash, and an Arsenite of Potash is formed and remains in solution. The Tincture of Lavender is intended only to give a little colour. f ℥j. contains grs. iv. of Arsenious acid, and ♏lx. contain gr. ½ of the same acid.

D. ♏iij.—v. increased to ♏xx. two or three times a day.

Liquor Arsenici Chloridi, L. Solution of Chloride of Arsenic. De Valangin's *Solutio Solventis Mineralis.*

This solution is an authorized form of a preparation that has been for some time in use, and was introduced by Dr. De Valangin towards the close of the last century. The inventor prepared what he called " Solvent Mineral," by subliming Arsenious acid with Common Salt; the product was then dissolved in dilute Hydrochloric acid. But by the sublimation with salt no chemical change is effected, pure Arsenious acid being sublimed. This part of the process has therefore been discarded by the L. C.

* To prevent Arsenic and its compounds from being used in poisoning, the new *Act to regulate the Sale of Arsenic* imposes the following restrictions on Druggists and retailers. It is provided,

1. That no Arsenic shall be sold without an entry being made in a book of the purpose for which it is required—with the date, name, and occupation of the purchaser—to be signed by the purchaser and the seller.
2. That either the purchaser must be known to the seller, or the sale must be made in the presence of a witness known to both, who also must sign the entry. That the purchaser must be of full age.
3. That, unless in a quantity of at least ten pounds, no Arsenic shall be sold at all without being first mixed up with Soot or Indigo, in the proportion at least of 1 ounce of Soot or ½ an ounce of Indigo to each pound of Arsenic.
4. From these regulations, which are enforced under a heavy penalty, the prescriptions of medical men are excepted.

Prep. L. Take of *Arsenious Acid,* broken into small pieces, ʒß., and boil it until dissolved in *Hydrochloric'* fʒiß., mixed first with *Dist. Water* ℥j.; then add to this *Dist. Water* sufficient to measure accurately Oj.

In one ounce of this solution $1\frac{1}{2}$ grains of Arsenious acid are dissolved. But it is most probable that the solution contains a Terchloride of Arsenic. Thus, when 3 Eq. of H Cl act upon 1 of Arsenious acid ($As\,O_3$), the Oxygen and Hydrogen unite to form 3 Eq. of water, and 3 Cl form with the Arsenic a soluble Terchloride.

$$As\,O_3 + 3\,H\,Cl = As\,Cl_3 + 3\,H\,O.$$

When the solution is evaporated, it seems to be again decomposed, and Arsenious acid separates in small crystals. Thus Mr. Phillips considers that when dissolved first in the Hydrochloric acid it remains undecomposed.

Arsenic may be detected in this solution by the tests already enumerated. With a solution of Nitrate of Silver it produces a precipitate of Chloride, insoluble in Nitric acid, but soluble in Ammonia.

The solution of Chloride of Arsenic is considerably weaker than Fowler's solution, but is by many preferred to the latter.

Action. Uses. It is a good form for the exhibition of Arsenic generally. Action similar to the Arsenite of Potash, but supposed by some to be less irritating to the stomach. It is highly recommended by Drs. Bateman and Farre in the treatment of cutaneous diseases.

D. ♏iij.—♏xx., gradually increased.

Red Sulphuret of Arsenic was in ancient times employed in medicine, as it still is in India, together with the Yellow Sulphuret. The Red is commonly known by the name of Realgar, and is a natural production, but is also prepared artificially. It is a Bisulphuret ($As\,S_2 = 107$), and is usually met with in red vitreous masses, or as a red powder, being employed as a pigment. It acts as a poison, a part being converted into Arsenious acid in the stomach, though, after death, both the Bisulphuret and the acid are liable to be converted into the Tersulphuret, by means of the H S gas given off during the putrefactive process.

Yellow Sulphuret or Orpiment (Auripigmentum), Tersulphuret of Arsenic ($As\,S_3 = 123$), is a natural production, and may be produced artificially by passing H S through solutions containing Arsenious acid. The Orpiment of the shops is a mixture of Sulphuret and of Arsenious acid, and is hence more rapidly poisonous than natural Orpiment. King's Yellow is another impure Sulphuret, of which the finest kinds are said to be imported from the East. Dr. Christison states that, according to his experiments, it contains a large proportion of Sulphuret of Arsenic, some Lime, and about 16 per cent. of Sulphur.

Teriodide of Arsenic. Arsenici Teriodidum ($As\,I_3$) is an orange-red powder, without taste or smell, easily volatilized. It may be obtained by heating 1 part of metallic Arsenic with 5 parts of Iodine. It has been administered with benefit in doses of gr. $\frac{1}{8}$ gradually increased to gr. $\frac{1}{4}$ in some chronic cutaneous diseases, as Lepra and Psoriasis. It is contained in the next preparation.

Liquor Arsenici et Hydrargyri Hydriodatis, D. Solution of Hydriodate (Iodide) of Arsenic and Mercury. Donovan's Solution. Sol. of Iodo-Arseniate of Mercury (Soubeiran).

This preparation was introduced into medical practice by Mr. Donovan of Dublin, who, in 1839, published a form for preparing it, very similar to that now adopted by the D. C.

Prep. D. Rub together *Arsenic in fine powder* gr. vj., *pure Mercury* gr. xvj., *pure Iodine* ℈ij. gr. x ß., *Alcohol* f ʒ ß., until a dry mass is obtained; and having triturated f ℥viij. of *water* with this in successive portions, let the whole be transferred to a flask, and heated until it begins to boil. When cool add *Dist. Water* q. s. to fill up to f ℥viij. and f ʒvj.

The Alcohol aids the combination of the three substances. The Iodine used is about sufficient to convert the Arsenic into a Teriodide ($As\,I_3=453$), and the Mercury into Biniodide ($Hg\,I_2=452$). These too would be formed very nearly in equivalent proportions, to do which exactly would need 75 grains of metallic Arsenic, 200 of Mercury, and 630 of Iodine. The liquid may then be considered as a solution of Teriodide of Arsenic and Biniodide of Mercury combined together. The proportions of the 3 elements in 1 fluid ounce are equivalent to 1 gr. of Arsenious acid, 2 grs. of Binoxide of Mercury, and 6 grs. of Iodine.

The colour of the solution is a greenish-yellow; it has a styptic taste; it precipitates solutions containing Opium or Morphia. Mercury (Binoxide), Iodine, and Arsenic, may be recognized in it by their respective tests.

Soubeiran has proposed to form the two Iodides separately, and then to dissolve them, in such proportion that the solution shall contain $\frac{1}{100}$th part of each of the Iodides. It is a little stronger than Donovan's solution.

Action. Uses. It combines the effects of Arsenic and Mercury, with also those of Iodine. It has been used successfully in Syphilis, as well as in Lepra and other skin diseases.

D. ♏x.—ʒß.; to be given cautiously, like the other preparations of Arsenic.

Argentum, L. E. D.

Silver. *F.* Argent. *G.* Silber.

Silver, one of the most anciently known of the metals, is found native, or combined with Sulphur, in considerable quantities, also

as a Chloride, and alloyed with other metals, especially Lead, Gold, Antimony, Arsenic, Copper. It is separated from its ores by the process of amalgamation, or from Argentiferous galena, by roasting to expel the Sulphur, and submitting the lead (which contains Silver) to the process of cupellation. The Arabs are thought to have been the first to employ it in medicine. In its metallic state it is inert, but being little liable to alteration, or to be affected by reagents, it is much employed for surgical instruments, and for vessels for chemical purposes.

Prop. Silver (Ag=108) is remarkable for its whiteness and brilliancy, as well as for its malleability. Sp. Gr. 10·47. Unalterable in the air, with the exception of a little tarnishing from the formation of Sulphuret of Silver. It melts at a bright red heat (1873° Daniell, 1830° Prinsep), but does not oxidize at any temperature, unless heated with some fusible siliceous substance, or acted on by Nit′. The Oxide of Silver is reducible by heat. Boiling Sul′ converts Silver into a Sulphate, while H Cl has little action, though it combines with Chlorine, as also with Cyanogen and Sulphur. The standard Silver of this country contains 18 parts of Copper to 222 of Silver.

Tests. Silver is sometimes mixed with Gold, usually with Copper, often with Lead. It is entirely dissolved by Dil. Nit′; (any Gold will remain undissolved as a dark-coloured powder.) The solution, on the addition of an excess of Chloride of Sodium, gives a white precipitate (Chloride of Silver), which an excess of Ammonia dissolves; (any Lead will be dissolved by the Nit′, and precipitated by the Chloride, but remain undissolved by the Ammonia). The Chloride of Silver being removed, and Hydrosulphuric acid added to the solution, it is not coloured by it, and nothing is thrown down (showing that both Lead and Copper are absent). Chloride of Lead is slightly soluble in cold, and still more in hot water. Iron, Copper, and Mercury reduce the solutions of Silver to a metallic state.

Pharm. Uses. Employed for making Nitrate of Silver.

Very thin sheets of Silver, constituting *Silver-leaf*, are used by the L. C. to detect the presence of Nitric in Acetic acid. A strip being digested in pure Acetic′, and H Cl afterwards dropped in, nothing should be thrown down. Pure Silver is soluble in Nitric, but not in Acetic acid.

Argenti Oxidum, D.

Oxide of Silver.

Oxide of Silver (Ag O=116) may be obtained by adding caustic Potash to a solution of Nitrate of Silver. ℥ij. of the former to ℥iv. of the latter substance will yield about ℥iij. of the Oxide of Silver. The Oxide is thrown down of a brown colour, is soluble in Ammonia, and to a small extent in water, which then has an alkaline reaction. M. Sementini (Journ. de Pharm. viii. 93) inferred that it was to this

Oxide that the antispasmodic properties of Nitrate of Silver were due. Mr. Lane (Med. Chir. Rev. 1840) has also argued that the Nitrate becoming Chloride of Silver in the stomach, and that being carried by the circulation to the cutaneous surface, is there converted into Oxide by the action of light and the strong affinity of Albumen; but that if the Oxide be prescribed, as it cannot penetrate the capillaries, its passage to the skin would not take place, and therefore the disfigurement or blue colour of the skin would be avoided, and the sedative effects of the Nitrate of Silver obtained without its causticity. Some exception, however, must be made to the latter part of this statement. It seems that the Oxide of Silver forms a soluble compound in the stomach, and is thus absorbed into the blood; and further, cases have been recorded in which discoloration has resulted from its use.

Prep. D. Dissolve *Nit. Silver* ℥ß. in *Dist. Water* f℥iv.; pour the solution into a bottle containing *Lime-water* Oiv., shake well, and set by until the sediment subsides. Separate by filtration; wash with distilled water, and dry it at a heat not exceeding 212°. Preserve in a stoppered bottle.

It has been prescribed in doses of gr. ß. to gr. j. 2 or 3 times a day in a pill with crumb of bread, gum, or with sugar. Dr. Stenhouse has shown that some of these reduce the Silver if aided by heat.

Action. Uses. An effective substitute for the Nitrate of Silver.

Chloride of Silver ($Ag\,Cl=144$) is always produced when Nitrate of Silver is added to a solution of a Chloride, for which, therefore, the former is always used as a test. It forms a curdy precipitate, at first white, afterwards becoming of a blackish-colour under the influence of light and moisture. It is insol. in water, and also in Nit′, but is soluble in Ammonia. Dr. Perry, of Philadelphia, considering that the Nitrate must in the stomach be converted into Chloride of Silver, inferred that this might be prescribed as an efficacious medicine to produce the alterative and tonic effects of Silver. This depends on the assumption (as also does the theory mentioned above), that Hydrochloric′ is the acid of the gastric juice. He prescribed it in doses of gr. $\frac{1}{2}$ to gr. iij. and gr. xij. 3 times a day, and states that, in less doses than 30 grs. no irritating effects result, but if that quantity be given at once it will produce emesis. (Brit. and For. Med. Rev. xii. 567.)

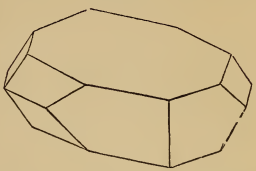
Argenti Nitras, L. E. D.

Argenti Nitras Fusa, L. D. *Argentum Nitratum.* Nitrate of Silver. Lunar Caustic. *Lapis Infernalis.* *F.* Nitrate d'Argent. *G.* Silbersalpeter.

Nitrate of Silver ($Ag\,O, N\,O_5=170$) was known to Geber, and has long been employed in medicine. Its two forms, *crystallized* and *fused*, were formerly supposed to possess different properties; but they differ only in molecular arrangement. In a crystallized state, Nitrate of Silver is white and transparent, in the form of hexangular

tables or right rhombic prisms, of a powerfully metallic taste, and so bitter as formerly to have been called *Fel metallorum*, as also *Centaurea Mineralis*. Heavy, without water of crystallization, permanent in the air, soluble in its own weight of water at 60° F., and in half its weight of boiling water; readily so in hot Alcohol, but the greater portion is again deposited on cooling. Subjected to heat it melts at 426° (at a higher heat it is decomposed), and is then run into moulds. Usually seen in sticks of a dark-grey colour; when fresh made, greyish coloured, striated, and radiated in structure. The change in colour is probably owing to its becoming reduced at the surface, dependent on organic matter in the air; strong light has been thought to reduce it, but Mr. Scanlan proved that if confined in a clean glass tube, hermetically sealed, and exposed to the light of the sun, it undergoes no change. It stains the skin of a blackish colour, as it does all organic matter, whether in solution or substance, and acts as a caustic on the latter. Its presence is readily distinguished by the white curdy precipitate which takes place on the addition of a Chloride or H Cl to its solution. The Chloride of Silver deposited becomes black on exposure to light, is dissolved by Ammonia, but not by Nit′. It is frequently employed in the P. as a test for Chlorides, and when ammoniated is one of the tests for Arsenious acid. Ferrocyanide of Potassium gives a white, and Hydrosulphuric′ a black, precipitate. Alkalis or Lime-water give a dark-brown precipitate of Oxide, soluble in excess of Ammonia. In a solution of Phosphate of Soda, or of an alkaline arsenite, Nit. Silver gives a yellow precip. The Phosphate of Silver is soluble in a small quantity of Ammonia, the Arsenite in a larger proportion. Comp. Ag O 68·24 N′ 31·76=100.

Fig. 34.



Prep. No form is given in the L. P., which orders that the *fused Nitrate* should be used for medicinal purposes, but that the *crystals* should be employed for testing.

E. Mix *pure Nitric′* f℥j. with *Dist. Water* f℥ij., add *pure Silver* ℥iß., and dissolve with the aid of a gentle heat; increase the heat gradually till a dry salt be obtained; fuse this gradually in a porcelain or earthenware crucible, and pour the fused matter into iron moulds, previously heated, and slightly greased with tallow. Preserve in glass vessels.

D. Similar: it is directed that the processes of fusion and moulding are to be conducted in the dark. The *crystals* may be obtained by evaporating the solution to the proper point. They should be dried without heat.

The Nitric′ heated in contact with the Silver, becomes decomposed, and a portion of its Oxygen combines with the Silver; the Oxide of Silver which is thus formed unites with the Nit′ remaining undecomposed, and thus Nitrate of Silver is obtained. The Nitrogen of the

decomposed Nit′ escapes in union with 2 Eqs. of Oxygen in the form of Nitric Oxide, which, uniting with a portion of the Oxygen of the atmosphere, fumes of Nitrous acid gas are observed.

$$3\,Ag + 4\,N\,O_5 = 3\,Ag\,O,\,N\,O_5 + N\,O_2.$$

By driving off the whole of the water, and continuing the heat, it is fused, and then run into moulds.

Tests. Apt to contain some reduced Silver, Nitrates of Copper, of Lead, of Zinc, and of Potash. It should be white; soluble in distilled water with the exception of a very scanty black powder (Silver); Copper immersed in this solution precipitates the Silver. If to 6 grains of Chloride of Sodium in solution be added 17 grains of the Nit. Silver, a further addition of the latter should precipitate nothing more from the filtered liquid. (L. P.) This last is a quantitative test of purity. It should be kept excluded from light and air. Other characters as detailed under SILVER. If Copper be present, the Nit′ would produce a greenish or blackish Nitrate of Silver, and Ammonia will change the solution to a bluish colour. Chloride of Sodium will precipitate the whole of the Silver in the state of Chloride, which will be dissolved by Ammonia.

The Chloride of Silver being removed, and Hydrosulphuric′ added to the solution, it is not coloured by it. If Zinc should be present, a white Sulphuret of Zinc will be precipitated; and if Copper, then a black Sulphuret of this metal. The solution being evaporated, any saline impurity will be left, and may be tested.

The Edinburgh College have also adopted a plan which provides against all sorts of adulterations collectively, without indicating the nature of the impurity. "Grs. xxix. dissolved in Aq. dest. f℥j. acidulated with Nit′, and precipitated with a sol. of grs. ix. of Muriate of Ammonia, briskly agitated for a few seconds, and then allowed to rest a little, will yield a clear supernatant liquid, which still precipitates with more of the test." 9·12 grs. of the Muriate (*i. e.* Hydrochlorate) of Ammonia will precipitate 29 grs. of Nitrate of Silver. If 9 grs. be added to that quantity of pure Nitrate of Silver, a further addition of the test will cause further precipitation. The data put down in the formula allow about one per cent. of impurity." (*c.*)

Inc. Sul′, Phosph′, H Cl, Tar′, H S, and the salts which contain these; Alkalis and their Carbonates; Lime-water. Ammonia in excess redissolves the precipitate first formed. Spring and River-water, when containing any of the above. Astringent Infusions, and other organic substances, as Albumen, Milk, &c.

Action. Uses. Ext. Stimulant, Escharotic, may be used as a Vesicant. *Int.* Antispasmodic, Sedative. Very large doses act as a Corrosive Poison. It is used as a *test* by the L. C.; for Chlorides, as in *Liquor Ammoniæ*, *Nitrate of Potash;* also to recognise *Phosphoric* and *Arsenious* acids; and as a quantitative test for *Iodide of Potassium.*

D. gr. $\frac{1}{4}$—gr. ij. or more, made into pills. Readily decomposed in the stomach by H Cl, Chlorides, &c. *Ext.* As a Lotion, of various strengths.

Antidotes. Chlorides, Milk, Albumen. Evacuate Stomach. Antiphlogistic treatment.

LIQUOR ARGENTI NITRATIS, L. Solutio Argenti Nitratis, E.

Prep. Dissolve *Nitrate of Silver* ʒj. in *Aq. dest.* f℥j. Filter. It must be used freshly prepared.

E. More dilute; gr. 40 in gr. 1,000.

SOLUTIO ARGENTI AMMONIATI, E. Solution of Ammoniaco-Nitrate of Silver.

Prep. Dissolve *Nitrate of Silver* gr. xliv. in *Aq. dest.* f℥j. Add gradually, and then cautiously, *Aqua Ammoniæ,* q. s. to nearly but not quite redissolve the precipitate at first thrown down.

This is a delicate test, commonly called Hume's test for Arsenious acid. (*v.* p. 224.)

ARGENTI CYANIDUM. Cyanide of Silver. *Cyanuret of Silver.*

The Cyanide of Silver (Ag Cy=134) is obtained as a white powder, heavy, without taste or smell, becoming of a violet hue by exposure to light and air. It is insoluble in water and caustic Potash, but soluble in caustic Ammonia. Heated, it yields Cyanogen, and is reduced to Silver. H Cl or Hydrosul′ readily decompose it, Hydrocyanic acid (q. v.) being evolved. Comp. Ag. 80·6+Cy 19·4=100. It is not now officinal.

Prep. Dissolve *Nitrate of Silver* ℥ij. and ʒij. in *Aq. dest.* Oj. Add dilute *Hydrocyanic′* Oj. Mix. Wash the precipitate with Aq. dest. and dry it.

Cyanide of Silver is precipitated, as the Cyanogen of the Hydrocyanic′ combines with the Silver of the Nitrate. The Hydrogen of the acid combining with the Oxygen of the Oxide of Silver, some water is formed, which remains in solution, with the Nitric′.

Use. It may be employed to obtain Hydrocyanic acid (q. v.) extemporaneously.

AURUM. L.

Gold. *Sol. Rex Metallorum. F.* Or. *G.* Gold.

Gold (Au=200) being always found native, was one of the earliest known metals, and is highly esteemed for its many valuable properties. By some the Greeks, by others the Arabs, are supposed to have been the first to employ it medicinally. The Alchymists diligently investigated its properties for the purpose of finding the elixir of life and the universal remedy; but the Hindoos seem to have preceded them in this course.

Prop. Gold is the most ductile and malleable of all metals. Its fusing point is above that of Silver. At a very intense heat it is slightly volatile, and burns with a green flame. Its Sp. Gr. is 19·5. Its oxide is reducible by heat. Gold is unchanged in the air, and soluble in no acid but Nitro-hydrochloric (q. v.), which owes this property to the presence of Chlorine in a free state. Oxygen unites with it in several proportions. It is characterized by a purple precipitate being produced when Protochloride of Tin is added to a solution of Chloride of Gold, and by Protosulphate of Iron causing a brown precipitate which, with the aid of the blowpipe, may be fused into a globule of Gold.

Uses. It is employed by the L. C. in the state of gold leaf, as a test for free Chlorine in Hydrochloric acid. Pure H Cl will not dissolve gold leaf, but does so when free Cl is present. (Both Hydrochloric and Nitric acids are liable to contain free Chlorine, on account of the frequent presence of Chlorides in the Nitrate of Potash, and of Nitrates in the Chloride of Sodium. So that in the preparation of either of these, some of the other acid is produced, and they react on each other, producing Chlorine and an Oxide of Nitrogen.)

PULVIS AURI. Gold-leaf, rubbed up with Honey, or, as in the Fr. Codex, with Sulphate of Potash, and then washed with water, is left in the state of a fine powder of a brown colour. It was submitted to experiment by M. Chretien and by M. Lallemand, and found to be mild in action but certain, of considerable benefit as an antisyphilitic, and in different affections of the Lymphatics, which it stimulates, in doses of gr. $\frac{1}{4}$ to gr. j. two or three times a day, or applied in friction on the tongue.

OXIDES OF GOLD. ($Au\,O_2$: $Au\,O_3$.) Oxygen combines with Gold in several proportions. A preparation, the *Purple Powder of Cassius*, which has been long employed, is supposed to owe its efficacy to the presence of Deutoxide of Gold. It is obtained by precipitating Chloride of Gold with Protochloride of Tin, when what is supposed to be a Deuto-Stannate of Gold is obtained. This Oxide was the active ingredient of some old preparations, as the Crocus Solis.

PERCHLORIDE OF GOLD ($Au\,Cl_3 = 308$), formed when Gold is dissolved in Nitro-Hydrochloric acid, is very liable to decomposition. In action and virulence it is analogous to Corrosive Sublimate. It readily combines with other metallic Chlorides.

CHLORIDE OF GOLD AND SODIUM ($Na\,Cl, Au\,Cl_3, 4\,H\,O = 404$) is now usually employed instead of the foregoing, as being more permanent in character and less costly. It is in elongated crystals, of a deep yellow colour, not alterable in the air, soluble in water. It consists of single equivalents of Chlor. Sodium and Terchloride Gold,

with 4 of water of crystallization. It is the most to be depended on of these preparations. It may be prescribed in pill with Liquorice powder or Starch, or in solution. One mode of administering it is to divide the first grain into 15 parts, the second into 14, then into 12, 10, and so on, giving one of the fractional parts every morning. It has been given in $\frac{1}{4}$ and also $\frac{1}{2}$ gr. doses; or it may be applied by friction to the tongue mixed with 3 times its weight of Iris root powder. (See Dict. Univ. de Matière Médicale of Merat and De Lens for a full article on this subject.)

Platinum.

Platinum is found native, alloyed with other metals. It is of a greyish-white colour; malleable and ductile; Sp. Gr. 20·80; infusible at any heat, excepting that of the oxyhydrogen blowpipe; unchanged by air or moisture; insoluble in any acid but Nitrohydrochloric (on account of the Chlorine which this contains). Pt=99. The metal may be obtained by igniting one of its salts, the oxide being reduced by heat; or it may be precipitated from its solutions by nascent hydrogen, evolved from Zinc and dilute Sulphuric acid. It is thus obtained in a state of fine division, *Spongy Platinum*, which, when introduced into a mixture of Oxygen and Hydrogen, causes them to combine, with the evolution of heat.

Platini Bichloridum, L. Bichloride of Platinum.

This salt ($Pt\,Cl_2$=171) is obtained by dissolving Platinum in Aqua Regia with the aid of heat, and evaporating the solution to a syrup, which, when cool, concretes into a crystalline mass. It is very soluble in water and in Alcohol. The aqueous solution precipitates solutions of Potash and Ammonia yellow, forming Platino-chlorides of Potassium and Ammonium. It does not precipitate Soda. Precipitates are thrown down from the solutions of most of the vegetable alkaloids.

The alkaline Platino-chlorides are even more insoluble in Alcohol than they are in water. Thus an alcoholic solution of this salt is used as a test. It is employed by the L. P. as a positive test for Potash, and as a negative test for the purity of the compounds of Soda.

A TABULAR ARRANGEMENT

DERIVED FROM THE

Scientific Names.	Chemical Composition.	Source or Production.
(Italics not in L. P.)		
ACIDUM ARSENIOSUM .	$As O_3 = 99$	Roasting Arsenical Pyrites. Silesia; Cornwall.
Acidum Carbonicum .	$C O_2 = 22$	Decomposing Chalk or Marble with a strong acid.
ACIDUM HYDROCHLORICUM.	$H Cl = 37$ (a gas). A strong solution, s. g. 1·160. (L.)	Decomposing common Salt with Sulph. acid.
ACIDUM HYDROCYANICUM (Dilutum.)	$H, C_2 N = H Cy = 27$. A weak solution, containing 2 per cent. (L.)	Distilling Sulph. acid with Ferrocyanide of Potassium.
ACIDUM HYDROSULPHURICUM.	$H S = 17$ (a gas) . . .	Decomposing Sulphuret of Iron with a min. acid.
ACIDUM NITRICUM . .	$N O_5 = 54$ (a gas). A strong solution, s. g. 1·42. (L.)	Distilling Sulph. acid with Nitrate of Potash (or Nit. Soda).
Acidum Nitrohydrochloricum.	Contains free Chlorine and an Oxide of Nitrogen.	Mixing Nitric', 1 part, with Hydrochloric', 2 parts. D. P.
ACIDUM PHOSPHORICUM (Dilutum).	$P O_5, 3 H O = 99$. A solution, s. g. 1·064. (L.)	Oxidation of Phosphorus by heating with Nit. acid.
ACIDUM SULPHURICUM .	$S O_3 = 40$. A strong solution, s. g. 1·843. (L.)	Burning Sulphur with Nitrate of Potash in leaden chambers containing water.
ALUMINÆ POTASSIO-SULPHAS.	$KO, SO_3 + Al_2 O_3, 3 SO_3 + 24$ aq. $= 476$.	Made at Whitby, &c., by roasting or exposing Aluminous slate; adding afterwards a salt of Potash.
Ammonia . . .	$N H_3, = 17$ (a gas) . .	Decomposing Hydrochlorate of Ammonia with Lime.

OF THE MATERIA MEDICA,

MINERAL KINGDOM.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
Liq. Pot. Arsen. (4 gr. in 1 oz.) Liq. Arsen. Chlor. ($1\frac{1}{2}$ gr. in 1 oz.)	Antiperiodic and alterative. In large dose, an irritant poison.	Ague. Convulsive disorders. Skin diseases.
. . . .	Stimulant to stomach. Narcotic poison when inhaled.	Dyspepsia; given commonly in *Soda water.*
Acid. Hyd. dilutum. (1 part to 3 of water).	Astringent. Mineral tonic. Counteracts alkalinity. Corrosive when strong.	Weakness of stomach; alkaline dyspepsia.
. . . .	Sedative, anticonvulsive; a powerful poison.	Convulsive coughs; Gastrodynia, &c.
. . . .	A narcotic poison when inhaled.	*Used as a test for the metals.*
Acid. Nit. dilutum. (3 parts to 17 of water).	Astringent. Mineral tonic. Counteracts alkalinity. Corrosive when strong.	Antalkaline and refrigerant in fevers.
. . . .	Has a peculiar alterative action in the blood.	Dyspepsia; Oxalic diathesis; Liver diseases.
. . . .	Astringent. Mineral tonic. Antalkaline.	Dyspepsia. Mollities ossium.
Acid. Sulph. dilutum. (15 dr. in 1 pint).	Astringent. Mineral tonic. Refrigerant. Corrosive when strong.	Sweating; internal hæmorrhage; Prurigo; Phosphaturia.
Alumen Exsiccatum. (without water). Liq. Aluminis Comp. (contains Sulph. Zinc.)	Astringent, styptic. . .	Hæmorrhages. Ophthalmia of infants. Mucous fluxes. Lead colic.
Liquor Ammoniæ. (s. g. ·960). Liquor Amm. Fortior. (3 times as strong, s.g. ·882). Tinct. Amm. Comp. Linimentum Ammoniæ. Linim. Hydrargyri.	Stimulant, antispasmodic. Rubefacient externally.	Threatened syncope. Typhus; Influenza. Hysteria and Epilepsy.

Scientific Name.	Chemical Composition.	Source or Production.
Ammoniæ Acetas.	$NH_3, C_4H_3O_3, HO=77$	Decomposing Sesquicarbonate with Acetic acid.
Ammoniæ Bicarbonas	$NH_3, 2CO_2+2$ aq. $=79$	Exposing Sesquicarbonate to the air.
Ammoniæ Carbonas	$NH_3, CO_2, HO=48$	In solution, by distilling the Hydrochlorate with Carb. Potash and some liquid.
Ammoniæ Citras	$3NH_3, C_{12}H_5O_{11}=216$	Decomposing Sesquicarbonate with Citric acid.
AMMONIÆ HYDROCHLORAS	$NH_3, HCl=54$	In various ways from the impure Carbonate in Gas liquor and Bone spirit.
Ammoniæ Hydrosulphas	$NH_3, HS=34$	Passing HS gas through solution of Ammonia to saturation.
AMMONIÆ OXALAS.	$NH_3, C_2O_3, HO=62$	Decomposing Sesquicarbonate with Oxalic acid.
AMMONIÆ SESQUICARBONAS.	$2NH_3, 3CO_2, 2HO=118$	Subliming the Hydrochlorate with Chalk.
ANTIMONII POTASSIO-TARTRAS.	$KO, SbO_3, C_8H_4O_{10}+3$ aq. $=360$.	Heating Tersulphuret with Sulph. acid to dryness—washing with water—and boiling the Disulphate thus produced with solution of Supertart. Potash, &c.
ANTIMONII OXYSULPHURETUM.	SbO_3+5SbS_3+15 aq. (A mixture only.)	Boiling Tersulphuret with solution of Soda, adding then Sulph. acid, and washing Precip.
Antimonii Terchloridum	$SbCl_3=237$	Dissolving Tersulphuret in Hydrochlor. acid.
Antimonii Teroxidum	$SbO_3=153$	Washing Disulphate (or Subchloride) with solution of Carb. Soda.
ANTIMONII TERSULPHURETUM.	$SbS_3=177$	Crude ore of Antimony. Hungary, Borneo, Persia.
Aqua	$HO=9$	Seas; Rivers; Springs; Clouds. Purified by distillation.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
Liq. Amm. Acetatis.	Refrigerant. Diaphoretic.	As a saline in fevers and inflammations.
. . . .	Similar to Amm. Sesquicarb.; milder.	
Spir. Amm. Aromat. Spir. Amm. Fœtidus.	Stimulant, Antacid, rubefacient.	Same cases as Ammonia.
Liq. Amm. Citratis.	Refrigerant. Diaphoretic.	As a mild and agreeable saline in fevers, &c.
Ferri Ammonio-chlorid. Liq. Hydrarg. Bichlor.	Alterative saline. Diaphoretic. Refrigerant externally.	In Liver diseases. Chronic inflammations. Cooling lotion for bruises.
. . . .	Similar to Sulph. Hydrogen.	Has been given in Diabetes mellitus. *Used as a test.* D. P.
. . . .	Poisonous. . . .	*Used as a test for Lime.*
Liq. Amm. Sesquicarb. Linim. Amm. Sesquicarb.	Stimulant, Antacid. Emetic in large doses. Rubefacient externally.	In fainting. Low states of system. Convulsive disorders.
Vinum Antimonii Potassio-tartratis. (2 gr. in 1 oz.) Ung. Antim. P. tart.	Diaphoretic, nauseant, or emetic, according to dose. Antiphlogistic.	Emetic, in incipient inflammations, &c. Antiphlogistic, in pneumonia, acute bronchitis, sthenic fevers.
Pil. Hyd. Chlorid. Co. (*Plummer's Pill*).	Alterative. Variable; depends on Teroxide, q. v.	
. . . .	A powerful caustic.	Poisonous bites. Fungous tumours.
Pulv. Antim. Co. (contains also Antimonious acid, and Phosph. Lime).	Diaphoretic, nauseant, alterative.	Fevers and inflammations.
. . . .	Scarcely any. . .	
Aqua Destillata . .	Solvent for medicines. Increases all secretions.	

Scientific Name.	Chemical Composition.	Source or Production.
Argenti Cyanidum . .	Ag Cy=134	Precipitating solution of Nit. Silver with H Cy.
Argenti Nitras . .	$Ag\,O, N\,O_5=170$ . . .	Dissolving Silver in Nitric acid.
Argenti Oxidum . .	Ag O=116	Adding Lime-water to solution of Nit. Silver.
Argentum . . .	Ag=108	By *Cupellation* from Argentiferous Galena, &c.
Arsenici et Hydrargyri Teriodidum.	$As\,I_3+Hg\,I_2=905$ . .	Triturating together Arsenic, Iodine, Mercury, and Spirit. The mass, dissolved in water, forms '*Donovan's Solution.*'
Arsenici Terchloridum .	$As\,Cl_3=183$ . . .	In solution, by dissolving Arsenious acid (q. v.) in Hydrochloric acid.
Auri Sodio-terchloridum	$Na\,Cl, Au\,Cl_3, 4\,H\,O=404$.	Dissolving together 85 parts of Terchloride Gold with 15 of Chlor. Sodium, and crystallizing.
Auri Terchloridum .	$Au\,Cl_3=308$ . . .	Dissolving Gold in Aqua Regia.
Aurum	Au=200	Native in many parts of the world.
Barii Chloridum . .	Ba Cl=105	Dissolving Carbonate Baryta in Hydrochloric′.
Barytæ Carbonas . .	$Ba\,O, C\,O_2,=99$ . . .	*Witherite*, native in England.
Bismuthi Nitras . .	$Bi\,O_3, N\,O_5, H\,O=300$.	A Ternitrate is made by dissolving Bismuth in Nitric acid. Water being added, the Nitrate precipitates, a Supernitrate remaining in solution.
Bismuthum . . .	Bi=213	Native, nearly pure, in Saxony and Cornwall.
Brominium . . .	Br=78	Set free by the action of Chlorine on the *Bittern* of sea-water.
Calcii Chloridum .	Ca Cl=56	Decomposing Chalk with Hydrochloric acid.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	Poisonous. . . .	*Has been used to obtain HCy extemporaneously.*
Liq. Argent. Nitratis. (1 dr. in 1 oz. A test).	Caustic, astringent. Antispasmodic.	Applied to sores and inflamed mucous surfaces. Internally in epilepsy and gastrodynia.
. . . .	Antispasmodic. Less active than Nitrate.	Internally as above.
. . . .	. . . .	*Silver-leaf is used to test the purity of Acetic acid.* (L. P.)
. . . .	Alterative. . . .	Lepra. Scrofulous forms of syphilis.
Liq. Arsen. Chlorid. (*De Valangin's solution*).	Antiperiodic; alterative; irritant.	Ague. Lepra. Chorea.
. . . .	Irritant; alterative. Causes salivation. Increases the secretions.	Secondary syphilis. Locally to scrofulous ulcers.
. . . .	Similar to last. . .	Similar to last.
. . . .	. . . .	*Gold-leaf, as a test for free Chlorine in Hydrochlor. acid.* P. L.
Liq. Barii Chlor. (1 dr. to 1 oz. A test).	Irritant. Alterative. Stimulates absorbents.	*(Used chiefly as a test for Sulphuric acid).*
. . . .	Poisonous. . . .	
. . . .	Astringent; antispasmodic; sedative.	Gastrodynia. Pyrosis. Diarrhœa.
. . . .	. . . .	*Used to make the nitrate.*
. . . .	Alterative; resolvent; diuretic. Stains the skin brown.	Bronchocele, Scrofula, and same cases as Iodine.
. . . .	Alterative; resolvent. Stimulates absorbents.	Bronchocele, Scrofula, and as Iodine.

Scientific Name.	Chemical Composition.	Source or Production.
CALCIS CARBONAS . .	$Ca\,O, C\,O_2=50$ . . .	Native; as Chalk and Marble, &c.
Calcis Hypochloris . .	$Ca\,O, Cl\,O=72$ . . .	Passing Chlorine gas into chambers which contain Slaked Lime, forming *Calx Chlorinata. L.* (Hypochlorite Lime and Chlor. Calcium.)
Calcis Phosphas . .	$3\,Ca\,O, P\,O_5=156$ . .	Obtained (impure) by burning bones or horn.
CALX	$Ca\,O=28$	Burning Chalk, Marble, or Limestone.
CARBO	$C=6$	Burning wood under cover. *Carbo Animalis*, L., by burning bullock's blood.
Chlorinium . . .	$Cl=36$ (a gas) . . .	Heating Hydrochloric acid with Binoxide of Manganese.
CUPRI AMMONIO-SULPHAS	$N\,H_3, Cu\,O+N\,H_3, S\,O_3, H\,O=123$.	Rubbing together Sulphate of Copper and Sesquicarb. Ammonia.
CUPRI DIACETAS (Ærugo)	$2\,Cu\,O, C_4\,H_3\,O_3+6$ aq. $=185$	*Verdigris;* obtained on plates of Copper by arranging them in layers, with the refuse of grapes, or with vinegar.
CUPRI SULPHAS . .	$Cu\,O, S\,O_3, +5\,Aq=125$.	From the native Sulphuret, Copper Pyrites, by roasting, or exposure to the atmosphere.
CUPRUM . . .	$Cu=32$	In Cornwall; by roasting, and then smelting the native Sulphuret (*Copper Pyrites*).
Ferri Acetas . . .	$Fe_2\,O_3+3\,C_4\,H_3\,O_3=233$	The Tincture (D. P.) by digesting Persulphate of Iron with Acetate of Potash in Spirit.
FERRI AMMONIO-CITRAS	$3\,NH_3, 3\,Fe_2O_3, 2\,C_{12}H_5O_{11}=621$.	Dissolving moist Sesquiox. Iron in a proper excess of Cit. acid, adding Ammonia, and spreading out in thin layers to dry .

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
Creta præparata. (Purified by *Elutriation*). Mistura Cretæ. Pulvis Cretæ Comp, Pulv. Cret. co. cum Opio.	Absorbent and Desiccant externally. Antacid; Astringent.	To burns, or Erysipelas. In Ointment, to Ulcers. Diarrhœa.
Calx Chlorinata.	Deodorizing and antiseptic. Decomposes putrid gases.	Externally to Gangrene, foul ulcers, discharges. Internally in Putrid Fevers and Dysentery.
. . . .	Slightly antacid, &c.	Has been given in Rickets.
Liquor Calcis.	Antacid; alterative; astringent.	Dyspepsia; Diarrhœa; Lithic calculus.
Cataplasma Carbonis.	Antiseptic. Absorbs offensive gases and vegetable compounds.	To foul ulcers; antidote to vegetable poisons. *In Pharmacy to absorb colours.*
Liquor Chlorinii. (Fresh prepared; — used as a test).	Antiseptic; deodorizer; alterative.	Inhaled in Phthisis; antidote to Hydrocy. acid; Dyspepsia.
Liq. Cup. Amm. Sulph. (1 dr. in 1 pint).	Antispasmodic; Emetic. Caustic and stimulant externally.	Epilepsy; lotion in gonorrhœa, and ulcerated cornea.
Linimentum Æruginis. (with vinegar & honey).	Escharotic externally. Internally an irritant poison.	Applied to venereal ulcers and warts.
. . . .	Caustic; astringent; emetic; antispasmodic.	Diarrhœa; Dysentery; Ague; Epilepsy; to repress fungous granulations.
. . . .	. . . .	*Used as a test for Silver in solution.* P. L.
. . . .	Tonic, &c.; a mild chalybeate.	As below.
. . . .	A good but mild chalybeate tonic—*i. e.* it tends to restore the red colouring matter of the blood.	In Anæmia; Amenorrhœa; Hysteria; Scrofula; Cancer.

Scientific Name.	Chemical Composition.	Source or Production.
Ferri Carbonas . .	$Fe O, CO_2=58$ . . .	Precipitating solution of the Sulphate with Carbonate of Soda, drying quickly, or preserving with sugar.
Ferri Citras . . .	$3Fe_2O_3, C_{12}H_5O_{11}=405$ (?)	Saturating a solution of Cit. acid with moist Sesquioxide of Iron.
Ferri Iodidum . .	$Fe I=154$	Heating iron wire with Iodine and water, and evaporating the solution.
Ferri Lactas . . .	$Fe O, C_6 H_5 O_5, 3 H O=144$	Dissolving iron in dilute Lactic acid, or sour milk.
Ferri Oxidum Nigrum .	$Fe O+Fe_2 O_3=Fe_3 O_4=116$ (Probably a mixture only.)	Precipitating by Ammonia a mixed solution of the Sulphate and Persulphate of Iron. (D).
Ferri Pernitras . .	$Fe_2 O_3, 3 N O_5=242$ . .	Dissolving iron in excess of Nitric acid (D. P.)
Ferri Phosphas . .	$3 Fe O, P O_5=180$ . .	Precipitating solution of Sulph. Iron with Phosph. Soda. (Un. States' Pharm.)
FERRI POTASSIO-TARTRAS	$K O, Fe_2 O_3, C_8 H_4 O_{10}=260$	Adding the hydrated Sesquioxide to a hot solution of Supertartrate of Potash.
Ferri Sesquichloridum .	$Fe_2 Cl_3=164$ . . .	Dissolving Sesquioxide of Iron in Hydrochloric acid.
Ferri Sesquiferrocynanidum.	$Fe_4 Cfy_3=Fe_7 Cy_9=430$.	Precipitating a Persalt of Iron with Ferrocy. Potassium.
FERRI SESQUIOXIDUM .	$Fe_2 O_3=80$	Mixing hot solutions of Sulphate Iron and Carbonate Soda, and drying in the air the Carbonate of iron thus formed.
Ferri Sesquioxidum Hydratum.	$Fe_2 O_3, 3 H O=107$ . .	Heating solution of Sulph. Iron with Nit'. and Sul'.; precipitating with Ammonia the Persulphate formed; using moist and fresh.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
Ferri Carb. c. Saccharo. Mistura Ferri Composita. Pilula Ferri Composita.	A very efficient chalybeate.	In anæmia, and the disorders associated with it.
. . . .	Like the Ammonio-citrate.	As above.
Syrupus Ferri Iodidi. (about 5 gr. in 1 dr.—the sugar retards oxidation).	Combines a chalybeate action with the alterative properties of Iodine.	Particularly useful in anæmia of scrofulous children.
. . . .	A mild chalybeate. . .	As the Ammonio-citrate.
. . . .	Rather inert. . . .	Rarely used.
. . . .	An irritant chalybeate; astringent.	Anæmia; Diarrhœa.
. . . .	Astringent chalybeate. .	Amenorrhœa; Cancer.
Vinum Ferri. (probably contains it).	A good mild chalybeate, with a pleasant taste.	In Anæmia; Amenorrhœa; Hysteria; Scrofula; Cancer.
Ferri Ammonio-chlorid. (15 parts with Hydrochlor. Ammonia 85). Tinct. Ferri Sesquichlor. Tinct. Ferri Ammonio-chlor.	An active astringent chalybeate. The Tincture is also diuretic.	As above; useful in torpid, but not in irritable subjects.
. . . .	Poisonous. . . .	
Emplastrum Ferri.	Tonic chalybeate; emmenagogue.	Used especially in Tic douloureux and Cancer.
. . . .	As the last; more soluble in the fluids.	Used as an antidote in poisoning by Arsenious acid.

Scientific Name.	Chemical Composition.	Source or Production.
FERRI SULPHAS . .	$Fe\,O, S\,O_3 + 7$ aq. $=139$.	Exposing to the air moistened Iron Pyrites (Bisulphuret).
Ferri Sulphuretum .	$Fe\,S=44$	Applying a roll of Sulphur to Iron at a white heat.
Ferri Valerianas . .	$Fe_2\,O_3, 3\,C_{10}\,H_9\,O_3=359$.	Mixing solutions of Persulphate of Iron and Valerianate of Soda, &c. (D.)
FERRUM . . .	$Fe=28$	Smelting native ores; Oxide, Carbonate, Bisulphuret.
Hydrargyri Acetas .	$Hg\,O, C_4\,H_3\,O_3=259$ . .	Mixing hot solutions of Nit. Mercury and Acet. Potash; separating on cooling.
HYDRARGYRI AMIDO-CHLORIDUM.	$Hg, Cl, N\,H_2=252$ . .	*Ammonio-chloride*, L. P. precipitated by Ammonia from solution of Bichlor. Mercury.
HYDRARGYRI BICHLORIDUM.	$Hg\,Cl_2=272$ . . .	Subliming Bipersulphate of Mercury with Chloride of Sodium.
Hydrargyri Bicyanidum	$Hg, 2\,C_2\,N=Hg\,Cy_2=252$.	Dissolving Binox. Mercury in Hydrocy. acid.
Hydrargyri Biniodidum	$Hg\,I_2=452$	Triturating together Mercury (1 eq.) and Iodine (2 eq.) with spirit.
Hydrargyri Binoxidum .	$Hg\,O_2=216$ . . .	Keeping Mercury long at a high temperature; or precipitating Bichlor. Merc. with Potash.
Hydrargyri Bipernitras .	$Hg\,O_2, 2\,N\,O_5=324$ . .	Dissolving Mercury in large excess of strong Nitric acid.
Hydrargyri Bipersulphas	$Hg\,O_2, 2\,S\,O_3=296$ . .	Boiling Mercury with strong Sulphuric acid to dryness.
HYDRARGYRI BISULPHURETUM.	$Hg\,S_2=232$ . . .	Melting together Sulphur (2 eq.) and Mercury (1 eq.).

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	Irritant and astringent chalybeate.	As a chalybeate in relaxed or torpid cases. In hæmorrhages; diarrhœa; mucous fluxes.
. . . . . .	Chalybeate and alterative.	In chronic skin diseases. *Used to prepare Hydro-sulphuric acid.*
. . . .	Tonic and antispasmodic.	Hysteria; Chorea; Epilepsy; Chlorosis.
Ferrum in fila tractum. (Iron wire). Vinum Ferri.	. . . .	
. . . .	A mild mercurial;—*v.* Hyd. Chlor.	Syphilis, &c.
Ung. Hydrargyri. Ammonio-chloridi.	Poisonous. Externally, stimulant and alterative.	As an application to ulcers; and in Eczema; Porrigo; Herpes.
Liq. Hyd. Bichlor. (½ gr. in 1 oz.)	Irritant poison; alterative in small doses; rarely causes salivation.	Secondary syphilis; skin diseases; chronic inflammations generally.
. . . .	Irritant mercurial. . .	As the Bichloride; rarely employed.
. . . .	Stimulant externally; internally, alterative and irritant.	As an application to ulcers. In Scrofula, and Scrofulous forms of Syphilis.
Hydrargyri Nitrico-oxidum. (Made by heating the Proto-nitrate; contains some Pernitrate). Ung. Hyd. Nit.-ox.		
Ung. Hydrargyri Nitratis. Ung. Hyd. Nit. Mitius.	Externally, stimulant and detergent.	As an application in Ophthalmia tarsi; Porrigo; Lepra; Psoriasis.
. . . .	. . . .	*Made in the preparation of Chloride and Bichloride.* L. P.
. . . .	Inert internally; stimulant externally.	Used for a fumigation in some chronic skin diseases.

Scientific Name.	Chemical Composition.	Source or Production.
HYDRARGYRI CHLORIDUM	Hg Cl=236 . . .	Rubbing Bipersulph. Mercury with Metallic Mercury; subliming Protosulphate (thus formed) with Chloride Sodium.
HYDRARGYRI IODIDUM	Hg I=326	Triturating together Mercury (1 eq.) and Iodine (1 eq.) with spirit.
Hydrargyri Pernitras .	$Hg\,O_2, N\,O_5$=270 . .	Dissolving Merc. with heat in Nit. acid, diluted with an equal bulk of water. (D. P.)
Hydrargyri Protonitras	$Hg\,O, N\,O_5$=262 . . .	Dissolving Mercury with a gentle heat in dilute Nit. acid (smaller quantity).
Hydrargyri Protoxidum	Hg O=208	In the moist way, by mixing Calomel with Lime-water.
Hydrargyri Sulphuretum	Hg S=216	Rubbing together Mercury (1 eq.) and Sulphur (1 eq.)
HYDRARGYRUM . .	Hg=200	Subliming the native Bisulphuret (*Cinnabar*) with Lime or Iron, &c.
IODINIUM . . .	I=126	Distilling the residual liquor of *Kelp* with Sulph. acid and Binox. Manganese.
MAGNESIA . . .	Mg O=20	Calcining the Carbonate.
Magnesiæ Bicarbonas .	$Mg\,O, 2\,C\,O_2$=64 . .	Passing Carb. acid gas into a mixture of water and Carb. Magnesia.
MAGNESIÆ CARBONAS .	$Mg\,O, C\,O_2$=42 . . .	Mixing hot solutions of Sulph. Magnesia and Carb. Soda.
MAGNESIÆ SULPHAS .	$Mg\,O, S\,O_3$+7 aq.=123 .	By evaporating the residue of sea-water after the separation of common salt.
MANGANESII BINOXIDUM	$Mn\,O_2$=44 . . .	Native ore of Manganese; *Black Oxide.*

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	Alterative; resolvent; cathartic; antiphlogistic; antisyphilitic; causes salivation.	Dyspepsia; Liver diseases; serous and mucous inflammations; Fevers; Iritis; Gout; primary Syphilis, &c.
Ung. Hyd. Iodidi.	Stimulant and alterative externally.	As a dressing to scrofulous ulcers.
. . . .	Internally like Hyd. Bichlor. A powerful caustic.	Applied as a caustic to syphilitic ulcerations.
. . . .	Mild mercurial; rarely used.	*Made in prep. of Nitrico-oxide.* L. P.
Hydrarg. c. Creta. (about gr. $\frac{1}{2}$ in 100). Ung. Hydrargyri. (about gr. 1 in 100).	Externally, alterative and antisyphilitic.	As *Black wash,* to syphilitic ulcers.
Emplast. Hydrargyri (contains a little).	Nearly inert. . . .	The plaster, in glandular affections.
Hydrarg. c. Creta. Pilula Hydrargyri. Unguentum Hydrargyri. Ceratum Hyd. Comp. Linimentum Hydrargyri. Emplastrum Hydrargyri. Emp. Ammoniaci c. Hyd.	(In a finely divided state)—alterative; resolvent; cathartic; antisyphilitic; may cause salivation; stimulant externally.	Milder than Hyd. Chlor.; used as a general alterative. Externally, to syphilitic sores, chronic swellings, &c.
Tinct. Iodin. co. Ung. Iodin. co. Liq. Pot. Iodidi co.	Alterative; stimulant to the absorbents; diuretic, and increasing secretion generally; in large doses irritant.	Scrofula; chronic enlargements of all kinds; Bronchocele; Ovarian tumours. Topically to tumours, eruptions, diseased joints.
. . . .	Antacid; mild cathartic.	Dyspepsia; Gout; acid poisoning; as a purge for infants.
. . . .	Antacid; laxative; refrigerant.	As the Carbonate.
. . . .	Antacid; mild aperient—apt to accumulate in the bowels.	As Magnesia, but less advisable in flatulent cases.
. . . .	Hydragogue purgative; saline and antiphlogistic.	As a purgative generally; particularly in febrile cases.
. . . .	. . . .	*Used in the preparation of Chlorine.* L. P.

Scientific Name.	Chemical Composition.	Source or Production.
PHOSPHORUS . . .	$P=32$	Digesting Bone-earth with dilute Sulph. acid; evaporating; mixing Superphosphate of Lime (thus formed) with Charcoal; & distilling over into water.
PLATINI BICHLORIDUM .	$Pt\,Cl_2=171$ . . .	Boiling Platinum in strong Nitro-hydrochloric acid.—(Aqua regia).
PLUMBI ACETAS . .	$Pb\,O, C_4\,H_3\,O_3, 3\,H\,O=190$	Dissolving Litharge in dilute Acetic acid; or exposing lead to fumes of vinegar.
Plumbi Carbonas . .	$Pb\,O, C\,O_2=134$ . . .	Exposing sheet lead to fumes of vinegar, in an atmosphere of $C\,O_2$ from fermenting Tan.
Plumbi Diacetas . .	$2\,Pb\,O, C_4\,H_3\,O_3$+aq.=365	Boiling Litharge in a solution of Acet. Lead.
PLUMBI IODIDUM . .	$Pb\,I=230$	Precipitating a solution of Acet. Lead by Iodide of Potassium.
Plumbi Nitras . .	$Pb\,O, N\,O_5=166$ . .	Dissolving Litharge in dil. Nit. acid, &c.
Plumbi Peroxidum . .	$Pb_3\,O_4=344$ . . .	*Red Lead;* by keeping Litharge exposed to the air at a heat below the fusion point.
PLUMBI PROTOXIDUM .	$Pb\,O=112$	*Litharge,* (*Oxidum semivitreum*), obtained by melting Lead in a current of air.
POTASSA . . .	$K\,O,=48$ . . . . . $K\,O, H\,O=57$	In solution, by decomposing Carb. Potash with Lime-water; the *Hydrate,* $K\,O$, $H\,O$, by evaporating this solution.
POTASSÆ ACETAS . .	$K\,O, C_4\,H_3\,O_3=99$ . .	Decomposing Carb. Potash by Acetic acid.
Potassæ Arsenis . .	$K\,O, As\,O_3=147$ . . .	In solution, by boiling Arsenious acid in a solution of Carb. Potash.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	In large doses an irritant poison; general stimulant; alterative; diuretic; diaphoretic.	Typhus; nervous prostration or debility; Impotence; Melancholia.
. . . .	Alterative; irritant; like Bichlor. Mercury.	*Used as a test for Potash.* L. P.
. . . .	Astringent, externally and internally; lowers the action of the heart; irritant in large doses.	Hæmoptysis; Diarrhœa; Melæna; profuse expectoration or sweating in Phthisis, &c.
. . . .	A poison, (as in white lead, or water); if long taken, produces colic and palsy.	Is sometimes applied to excoriations and ulcers.
Liq. Plumbi Diacet. Liq. Plumb. Diac. Dil. Cerat. Plumbi Comp. Cerat. Saponis Co.	Like the acetate, employed locally.	Applied (dilute) to the eye in Ophthalmia, and to inflamed parts generally.
Ung. Plumb. Iodidi.	Not very active; alterative externally.	Applied to indolent and scrofulous tumours.
. . . .	Powerful poison; like acetate, but stronger.	*Used chiefly for its antiseptic and deodorizing properties.*
. . . .	Like Protoxide; not used.	*Used in the E. P. to prepare Chlorine, and to purify Acet. acid.*
Emplastrum Plumbi. Ung. Plumb. Comp. Emplastra, Resinæ, Saponis, et alia.	Astringent and desiccant, when applied externally.	In the form of plaster, to bring together wounds, strap ulcers, compress swellings, &c.
Liquor Potassæ (s. g. 1·063). Potassæ Hydras. (in sticks). Potassa cum Calce.	The solid, a powerful spreading caustic. The solution internally—antacid; resolvent; alterative; diuretic; antiphlogistic.	As a caustic, for issues, to warts, and poisoned bites. Internally, in Scrofula; Syphilis; Gout; skin diseases; irritable bladder; Lithic calculus.
. . . .	In small dose, diuretic; large, purgative; becomes alkaline in the urine.	In dropsy; Liver disease; Lithic deposit in urine.
Liq. Potass. Arsenitis. (*Vide* Arsen. acid).	As Arsenious acid, of which it is the preparation generally used.	As Arsenious acid, q. v.

Scientific Name.	Chemical Composition.	Source or Production.
POTASSÆ BICARBONAS .	$KO, HO, 2CO_2$=101 . .	Passing Carb. acid through a solution of Carb. Potash.
Potassæ Bisulphas . .	$KO, HO, 2SO_3$+aq.=146	Residue left after making Nit. acid from Nitre and an excess of SO_3.
POTASSÆ CARBONAS .	KO, CO_2,=70—(anhydrous) $2(KO, CO_2)$+3 aq.=167 (Common cryst. salt.)	In Russia and North America, by lixiviation of the ash of wood.
POTASSÆ CHLORAS .	KO, ClO_5,=124 . . .	Passing Chlorine through a solution of Potash; or through a solution containing Lime (5 eq.) and Potash (1 eq).
POTASSÆ NITRAS . .	KO, NO_5,=102 . . .	By exposing to the air animal and vegetable matters along with calcareous earth containing Potash, &c. Native in India.
POTASSÆ SULPHAS . .	KO, SO_3=88 . . .	Heating the Bisulphate, or adding to it Carbonate of Potash.
POTASSÆ SUPERTARTRAS	$KO, HO, C_8H_4O_{10}$=189	*Bitartrate*, L. P.; deposited in an impure state during the fermentation of grape juice.
POTASSÆ TARTRAS . .	$2KO, C_8H_4O_{10}$=228 .	Adding Bitartrate, to saturation, to a hot solution of Carb. Potash.
Potassii Bromidum .	K Br=118	Heating Bromine with Iron and water; & decomposing with Carb. Potash the solution of Bromide of Iron.
POTASSII FERROCYANIDUM.	K_2, Cfy+3 aq.=213. (Cfy=Fe+3 C_2N).	Heating refuse animal matter with Carbonate of Potash in an iron pot, &c.
POTASSII ET HYDRARGYRI IODO-CYANIDUM.	K I+Hg Cy_2=418 . .	Precipitated on mixing strong solutions of Iodide Potassium and Bicyanide of Mercury.
POTASII IODIDUM . .	K I=166	Adding Carb. Potash to a solution of Iodide of Iron; or heating Iodate of Potash to a red heat.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	A mild antacid and antilithic.	Externally and internally in Gout and Rheumatism; Lithic deposit or stone.
. . . .	Acid purgative and astringent.	Rarely used.
Liq. Pot. Carb. (s. g. 1·473).	Like Potash, but not so powerful.	In Dyspepsia; Gout; Lithiasis, &c.
. . . .	Saline alterative; antiphlogistic; counteracts putrescence of the fluids (?).	Scarlatina; Typhus; Cholera; Aphthæ of the mouth.
. . . .	Saline alterative; antiphlogistic; diuretic.	In febrile disorders; acute Rheumatism; irritable bladder; Scurvy.
Pulv. Ipecac. Co. (used to divide the opium).	Saline purgative and alterative.	As a purge for children. In Dyspepsia.
. . . .	Acid, hydragogue purgative. In small dose, diuretic, refrigerant.	In febrile disorders; diuretic in dropsies; as a purgative, combined with others.
. . . .	Saline purgative; diuretic; alterative; turns to a carbonate in the blood.	Liver complaints, &c. In fevers, as an effervescing draught of Tart. acid and Carb. Pot.
. . .	Diuretic; alterative; like Iodide Potassium.	Scrofula; Goître; chronic enlargement of the Spleen.
. . .	Poisonous; not used in medicine.	*Used in the preparation of Hydrocyanic acid.*
. . . .	. . . .	*Used as a test for the presence of Mineral acids in Acid. Hydrocy. Dil.* P. L.
Liq. Pot. Iod. Co. Tinct. Iodin. Co. Ung. Iodin. Co. Emp. Pot. Iodidi.	Alterative; stimulant to the absorbents; diuretic, increasing secretions generally; in large dose irritant.	Syphilitic Periostitis; Bronchocele; Scrofula; chronic enlargements and slow inflammations. Topically as Iodine.

Scientific Name.	Chemical Composition.	Source or Production.
POTASSII SULPHURETUM	$KS_3=88$, or, $KS_5=120$	Fusing Sulphur with Carb. Potash in a covered crucible. (Sulphuret of Potassium and Hyposulphite of Potash are formed.)
Silica	$SiO_2=31$	Found in nature as Flint, Rock Crystal, &c.
SODA	$NaO=32$	Adding Lime to a solution of Carbonate of Soda.
Sodæ Acetas	$NaO, C_4H_3O_3+6$ aq.$=137$	Decomposing Carb. Soda with Acetic acid.
SODÆ BIBORAS	$NaO, 2BO_3+10$ aq.$=192$	Native in Thibet and Persia; made in Tuscany by saturating native Boracic' with Carb. Soda. *Borax*, L. P.
SODÆ BICARBONAS	$NaO, HO, 2CO_2=85$	Passing Carb acid gas through a solution of Carb. Soda, &c.
SODÆ CARBONAS	NaO, CO_2+10 aq.$=144$	Lixiviation of the ash of sea-weed (*Kelp* and *Barilla*), or by heating with Lime and Coal Sulph. Soda obtained from SO_3 and common salt.
Sodæ Hypochloris	$NaO, ClO=76$	Passing Chlorine through a solution of Carb. Soda; forming *Liq. Sod. Chlorinatæ*, L. P. (containing Hypochlorite and Bicarb. Soda, with Chlor. Sodium).
SODÆ PHOSPHAS	$2NaO,HO,PO_5+24$aq.$=361$	Acting on Bone-earth with Sulph. acid, adding Carb. Soda to the solution of Superphosphate of Lime thus formed, &c.
SODÆ POTASSIO-TARTRAS	$KO,NaO, C_8H_4O_{10}+8$aq.$=$ 284.	Adding Supertart. of Potash to saturation, to a hot solution of Carb. Soda.
Sodæ Sesquicarbonas	$2NaO, 3CO_2+4$aq.$=166$	Found native in Egypt and Tripoli.
SODÆ SULPHAS	NaO, SO_3+10 aq.$=162$	Made by the action of Sulph. acid on common salt (Chloride Sodium).

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	Stimulant; diaphoretic; resolvent; alterative; in large doses a sedative poison.	Internally and externally as a bath or lotion, in chronic skin diseases.
Silex contritus. (powdered flint).	Inert	*Used in preparing some distilled waters.* P. L.
Liquor Sodæ (s.g. 1·061).	Like Potash, but less efficacious; rarely employed.	*Used in the preparation of Antim. Oxsulph.* P. L.
. . . .	Like Acetate of Potash .	*Used in Pharmacy to prepare pure Acetic acid.*
Mel Boracis.	Saline diuretic; refrigerant; alterative externally; stimulant to the uterus.	Dropsies; Fevers; *Mel Boracis* to aphthæ of the mouth; to promote contraction of the uterus.
. . . .	Antacid; antilithic; resolvent; diuretic.	In Gastrodynia; Dyspepsia; Gout; Lithic deposit in urine; to make effervescing draughts.
Sodæ Carb. Exsiccata. (without 10 aq.)	Similar to Carb. Potash, but less acrid; less efficacious in lithic deposits.	Dyspepsia; Gout; Rheumatism; Lithiasis, &c.
Liquor Sodæ Chlorinatæ.	As Hypochlorite of Lime; antiseptic and deodorizing.	To putrid discharges, ulcerations, &c. Internally, in Typhus; Scarlatina; Ague.
. . . .	Mild saline purgative; antiphlogistic; supposed to supply a material to the blood.	Purgative for children, and in febrile cases. In Mollities ossium? In Diabetes?
. . . .	Mild saline diuretic and purgative; antiphlogistic; turns to Carbonates in the blood.	As a purgative generally, like Sulph. Magnes. In Lithiasis.
. . . .	As the Carbonate. . .	As the Carbonate.
. . . .	Saline purgative and antiphlogistic.	As a purgative generally, alone or in combination.

Scientific Name.	Chemical Composition.	Source or Production.
Sodæ Valerianas . .	$Na\,O, C_{10}H_9O_3$=125 .	Oxidizing *Fusel Oil* by heating it with Sulph. acid and Bichromate of Potash; saturating the Valerianic′ (thus obtained) with Caustic Soda.
SODII CHLORIDUM . .	$Na\,Cl$= 70	By the evaporation of sea-water, in France; and of the water of brine springs, in Cheshire.
STANNI PROTOCHLORIDUM	$Sn\,Cl, H\,O$=104 . . .	Dissolving Tin in boiling Hydrochloric acid, and evaporating the solution.
Stannum . . .	Sn=59	In Cornwall, by smelting with Charcoal the native Oxide and Sulphuret.
SULPHUR . . .	S=16	Native in Sicily; made in Germany by heating Iron Pyrites; purified by sublimation.
SULPHURIS IODIDUM .	S_2I=158	Heating in a water-bath 1 part of Sulphur with 4 of Iodine.
Zinci Acetas . . .	$Zn\,O, C_4H_3O_3$+7 aq.=154	Immersing sheet Zinc in a solution of Acetate of Lead. (D.)
ZINCI CARBONAS . .	$Zn\,O, C\,O_2$= 62 . . .	Native, as *Calamine*, purified by calcination and elutriation, forming *Calamina Præparata*, L. P.
ZINCI CHLORIDUM . .	$Zn\,Cl$= 68	Dissolving Zinc in Hydrochloric acid, &c.
ZINCI OXIDUM . .	$Zn\,O$=40	Precipitating a solution of Sulph. Zinc by Sesquicarb. Ammonia, and igniting the Carbonate produced. (P. L.)
ZINCI SULPHAS . .	$Zn\,O, S\,O_3$+7 aq.=143 .	Dissolving Zinc in dilute Sulphuric acid, and evaporating.
Zinci Valerianas . .	$Zn\,O, C_{10}H_9O_3$=133 .	Mixing solutions of Sulph. Zinc and Valerianate of Soda, evaporating, and separating crystals, (D.)
ZINCUM	Zn=32	Heating the native oxide or sulphuret; mixing with charcoal the oxide thus obtained; and distilling off the metal.

Preparations in L. P.	Medicinal Action.	Chief Cases in which Used.
. . . .	Antispasmodic; not used .	*Employed by the D. C. to prepare other Valerianates.*
. . . .	In small doses, helps digestion; in large doses, causes vomiting and purging.	As an emetic, in Cholera and cases of poisoning; as an enema, for worms.
. . . .	Antispasmodic; irritant poison.	*Used to detect the solution of Gold-leaf in Hydrochlor. acid.* L. P.
. . . .	*Pulvis Stanni,* Tin powder, as a mechanical anthelmintic.	
Sulphur Præcipitatum. Unguent. Sulphuris. Ung. Sulph. Co.	Diaphoretic, and stimulant to secretions generally; alterative; in large dose, cathartic.	Laxative in piles, &c. Internally and externally, in chronic skin diseases, especially Scabies.
Ung. Sulph. Iod.	Alterative and stimulant externally.	Applied in ointment, in Scabies; Porrigo; Lepra; Eczema.
. . . .	Astringent; antispasmodic.	In solution, as a wash to ulcers; and in Ophthalmia.
Ceratum Calaminæ.	Externally a mild astringent and desiccant.	Applied as cerate to, or dusted over, burns and ulcers.
. . . .	A powerful spreading caustic; internally, like the Sulphate.	Externally, to destroy nævi, and to malignant ulcers.
Unguentum Zinci.	Astringent and desiccant externally; rarely used internally.	In powder or ointment, to burns and excoriations; to Eczema, Impetigo, and other skin diseases attended with a discharge.
. . . .	Astringent; mineral tonic; antispasmodic; in large dose, an irritant emetic.	Emetic, in poisoning. In Epilepsy. In hæmorrhages. Externally and internally, in mucous discharges.
. . . .	Antispasmodic, tonic and astringent.	Hysteria; Chorea; Epilepsy.
. . . .	Inert	*Employed to prepare its salts.*

VEGETABLE MATERIA MEDICA.

MANY of the most valuable medicinal articles in use in the present day, as in ancient times, are yielded by the Vegetable Kingdom in all parts of the world. Some of them are indigenous products, others are obtained by foreign commerce. All have particular soils and climates where they can grow in full health and secrete the principles which make them useful as medicines in the fullest perfection. Some contain these diffused through their whole substance, when the whole herb or plant may be employed; others store them up only in particular parts or organs, which therefore are alone employed. Or we may use in preference some proximate principle, separated either by nature or art from the rest of the vegetable matter. It is necessary, therefore, to be acquainted with the parts and products of plants, as well as with the best methods of preserving or preparing them for medicinal use.

The parts of Plants which are used officinally, and which it is desirable to know, as well for the above purpose as for understanding the Classification employed in Botanical arrangements, are these.

FLOWERING PLANTS.

1. *The Organs of Vegetation.*

RADIX. The root: usually sunk in the earth, serving to fix the plant and to absorb nourishment for its use. This it does through the naked extremities (*spongioles*) of its fibrils or radicles. Some roots are reservoirs of nutritious matter for the plants of the succeeding year; but most of these are rather Rootstocks.

CAULIS. The stem is the part of the plant situated between the root and leaves, and which usually supports the parts rising above the ground. The differences are apparently so great among stems, that different names are applied to different varieties; they are, moreover, distinguished according to duration, into *annual*, *biennial*, and *perennial.* They differ remarkably in their mode of growth; some, called EXOGENOUS, as those of all European trees, grow by the deposition of a layer of wood on the outside of that of the previous year, so that the oldest and most matured parts are in the centre, and the softer on the outside. Others, again, as Palms, grow only by additions to their centre, such additions being successively pushed outwards; so that the circumference becomes the hardest part of these stems. These

are called Endogens. The term ACROGEN is applied to those which are formed by the union of the bases of leaves and the original axis of the bud from which they spring, as in Ferns; among these are also included those which grow by simple elongation or dilatation, where no leaves or buds are produced.

The stem of Exogens is distinguished into several parts, as — 1. The *Pith* in the centre, which is seldom used officinally, except in the case of that of the Sassafras. 2. The *Medullary sheath*, which surrounds the Pith. 3. The *Wood*, formed of concentric layers; and 4. The *Bark*, which lies on the outside, and is connected with the pith by means of the Medullary rays. It is divisible into four layers, — the *Epidermis* on the outside, then the *Epiphlœum*, and *Mesophlœum*, counting from without inwards, with the innermost of all, *Endophlœum*, commonly called *Liber*.

Rhizoma, or Rootstock, differs so much in position from the Stem, that it used to be considered a kind of Root; but it is in fact a prostate thickened stem, which produces leaves from its upper, and true roots from its under side. Many of the Radices or Roots of former Pharmacopœias are called Rhizomes in the present one, as that of Acorus Calamus. A creeping stem, or root as it used to be called, is a kind of Rhizoma.

Cormus. This term, or Corm, is applied to what is essentially a kind of stem, though it remains under ground, becomes of a roundish or ovoid figure, something resembling a Bulb in form, as in the Cormus of Meadow Saffron or Colchicum Autumnale.

Bulbus. A Bulb is roundish or ovoid, and consists of a flat fleshy disk, from the under surface of which true roots proceed, and on the upper surface arise fleshy coats, which are pressed close to each other either in an imbricate or tunicate manner, and enclose a true bud in their centre. Several are officinal, as those of Onion, Garlic, and Squill.

Gemmæ. Leaf-Buds are the rudiments of new shoots, and are either naked, or protected by particular coverings called Scales. None are mentioned in the Pharmacopœias, excepting those of Dyer's Oak, in an abnormal condition,—Gemmæ Morbidæ.

Folium. The Leaf is usually a broad and thin expansion of vegetable tissue, of a green colour. It varies, however, very much in form and figure, so as sometimes to be thick and fleshy. It consists 1. of the expanded part called *lamina* or blade, one or both surfaces of which may be covered by *stomata*, or breathing-pores; 2. the *petiole* by which it is attached to the stem, and where it is often supported by a pair of small leaves or *stipules*. The leaf may be simple,—or compound, that is, composed of several pieces united by a common petiole. It may have parallel or reticulate venation, and vary in a variety of ways. Many contain the most active principles of the plant, as those of Senna, Cajaputi, and others.

It is not necessary for the object in view to enter into the intimate texture of plants, or to describe the characters of Membrane and of Fibre, of Cellular or of Woody Tissue, or the peculiarities of the Vascular or of the Laticiferous Tissue.

2. *Organs of Reproduction.*

FLOS. The Flower, when in the state of Bud (Alabastrus), is, like the Leaf-Bud, surrounded by scales. The flower-bud consists of a fixed cellular central point, formed from the axil of a leaf, and surrounded by rudimentary leaves. The Flower consists essentially of the *Stamens* and *Pistils*, or the parts concerned in fertilization; but the term is commonly applied to the Floral Envelope consisting of the *Calyx* and *Corol*, usually supported by a *Bract* or Floral leaf, from the axil of which it proceeds. The apex of the pedicle, or the part of the plant to which the Flower is attached, is called the *Receptacle*, sometimes called *Thalamus* in compound words, as Thalamifloræ. Besides these, it is necessary to notice the disposition of Flowers on a plant, which is called their *Inflorescence*. All the parts of the flower, either separately or in their aggregate state, are employed medicinally; also the bracts, with the ultimate ramifications of the plant, when the whole plant, as in the Mints and other Labiatæ, is officinal; also the Cacumina, or Tops of plants, as in the Rosemary, *Semina* Santonicæ, &c.

CALYX. The Calyx is the outer of a double whorl of floral envelopes, usually of a green colour; but when there is only a single whorl, then this is called the *Calyx*. Sometimes the term *Perianth* is applied when it is difficult to distinguish whether it be single or formed by the union of both calyx and corol. The Calyx is formed of one or more pieces, or *sepals*. Being exterior, it is necessarily always *inferior*, but being either unattached to or adherent to the interior parts, it is in the latter case said to be *superior*, from being adherent to the ovary in its lower, and only free or visible as a distinct organ, in its upper part. All the outside of the flower is calyx.

COROLLA. The Corol is the inner of a double floral envelope, usually delicate in structure and brilliant in colour, consisting either of two or more pieces or *petals*, when it is said to be *polypetalous;* or these are united into one piece, when it is called *gamopetalous* by De Candolle, but *monopetalous* by most botanists. The Petals of Roses and of Corn Poppy are officinal.

STAMEN is the male organ, consisting of the *anther*, which is a case divided into cells, containing the *pollen*, a granular powder, or fecundating dust. The anther may be sessile; or it is supported by a *filament*,—or androphore, a term which is usually applied where several are united together. When the stamen is adherent to

the sides of the calyx, it is said to be *perigynous*, or surrounding the ovary; but if united both with the calyx and the ovary, then it is said to be *epigynous*, or *upon* the ovary. But when it is quite free, the term *hypogynous* is used, indicating both its real and apparent position *below* the ovary.

Disk is a part not observed in all plants, but includes everything produced between the stamens and ovary: it used to be commonly called Nectary. It is annular, foliaceous, scale-like, or usually like small glands. It may be considered to represent a whorl of undeveloped leaves.

Pistillum. The Pistil is the female organ, surrounded by the stamen and floral envelopes, consisting of the *ovary* divided into one or more cells, and containing one or more *ovules*, or the rudiments of future seeds. It is terminated by the *stigma*, which is properly a secreting surface, and humid to receive the pollen. The stigma is either sessile on the ovary, or separated from it by the *style*. In the same way that adherence of the calyx to the ovary makes it appear superior, so the ovary is in that case said to be *inferior;* but when the calyx is free and inferior, the ovary is *superior.*

The only part of an immature Pistil which is officinal, is the Stigma of the Saffron Crocus.

The suppression of any of these whorls of the floral series produces a difference of character, which is expressed by a name; as when the corol is absent, the flower is said to be *apetalous;* if the stamens are not developed, then the flower is said to be a *fertile* or *female* flower; but if the pistil is suppressed, then it is called a *male*, or *barren*, flower.

Fructus. The Fruit is the ovary arrived at maturity; with this some of the floral envelopes are occasionally united, and grow with it. The fruit consists of a *Pericarp*, and of the *Seed* or *Seeds* enclosed within it. Some few, from being imperfectly covered, are called *naked seeds.* A fruit may be *simple* when produced by a single flower, or *compound* when formed out of several flowers. As the Pistil is considered by Botanists to be formed out of one or more modified leaves, which are then called *carpels*, so the fruit must be similarly constituted, and the number of cells, and the partitions by which these are divided, must depend upon the number of carpels of which the fruit is composed; but it is observed that in consequence of some of the ovules becoming abortive, and the others growing inordinately, some of the cells may become abolished. It is therefore necessary to examine the ovary to ascertain the normal number of cells. As the fruit is the pistil arrived at maturity, it bears upon it some traces of the style, and necessarily consists both of the seed and of its covering or pericarp. It ought never, however small, to be called simply a seed. Therefore, in the last

two Pharmacopœias, many of the fruits are correctly so called, instead of being incorrectly denominated seeds, Semina. Many fruits are officinal, also the rind (Cortex) of some, and the pulp (Pulpa) of others; and in the case of the *Mucuna pruriens*, even the hairs with which the fruit is externally covered.

SEMEN. The Seed is the ovule (Vegetable Egg) arrived at maturity, and contains the rudiments of a plant similar to that by which it has been produced. It is attached by a funiculus to the inside of the ovary. It consists—1. Of the Integuments, *Tunicæ Seminales*, or Matured Sacs of the ovules. 2. Of Albumen. 3. Of the Amygdala or Kernel. Some seeds are naked, as in the true Gymnosperms. A few are imperfectly covered. All are marked with the *hilum* or *umbilicus*,—the point where the seed was attached to the parent plant; often also with the *micropyle*, or minute hole which was the *foramen* of the ovule, and to which the radicle is always opposite. On the outside of the proper seed-coats we sometimes observe an *aril* (arillus), which is an expansion of the funiculus or of the placenta. That of the Nutmeg, known as Mace, is officinal. Sometimes the seed is covered with a hair-like substance, such as Cotton, officinal in the E. P.

AMYGDALA. The Almond, or Kernel, consists of the Embryo with or without Albumen. The *Albumen* or *Perisperm*, situated between the Seed-coats and Embryo, is a mass of cellular tissue filled with organic matter, which is, during germination, converted into nutriment for the young plant.

EMBRYO is composed of one, two, or more Cotyledons or seminal leaves of the young plant, which consists also of the Plumule and Radicle. The Embryo may be erect or pendulous, &c.

FLOWERLESS OR CRYTOGAMIC PLANTS.

These plants, distributed into the natural groups of Ferns, Mosses, Lichens, Fungi, and Algæ, differ so much from others both in the parts of Vegetation and of Fructification, that they are generally treated of separately. Those therefore which afford any officinal plants will be mentioned in their proper places. It may suffice to state that their substance is composed chiefly of Cellular tissue, and that, being destitute of organs of fructification, they are propagated by *spores*, which differ from seeds in being free in their cavities,—forming simple sacs, which separate into four distinct masses which germinate from any part of their surface.

CLASSIFICATION OF PLANTS.

BESIDES the parts of plants which are employed officinally, it is necessary to notice the mode in which plants are classified, as well for the purpose of understanding as for appreciating the advantages of the

Natural Method of classification. Until of late years, the artificial system of Linnæus was adopted in this country; but botanists have now for many years been studying the natural affinities of plants. The publication in 1789 of the "Genera Plantarum Secundum Ordines Naturales Disposita" of A. L. de Jussieu, proved upon how satisfactory and comprehensive a basis such a classification might be formed; and the series in which Jussieu first arranged them is probably as natural as any that has since been proposed. The corrections and additions made by Mr. Brown in 1810 and subsequently, to the characters of many of these orders, gave them a stability which they have continued to retain. The system of the celebrated De Candolle of Geneva is now usually followed, not because it is considered perfect, but because under it, in his "Prodromus Systematis Naturalis," the greatest number of plants have been arranged, and thus the authors of several Floras have adopted it. It is the most convenient for reference, and serves as a good basis for studying the affinities of plants.

The parts of plants, or the compound organs of which they are formed, have been enumerated, but the internal structure requires also to be noticed. Dissection and the microscope show that plants are composed of Membrane and Fibre, formed into Cells and Ducts of different kinds, and into Woody, Vascular, and Laticiferous Tissues.

De Candolle* has laid it down as a fundamental proof of a classification being natural, that it arrives at the same results, whether considering the organs of reproduction, or those of nutrition.

He first divides all plants, as Linnæus had already done, into Phænogamous and Cryptogamous, or into Flowering and Flowerless Plants. The former have the organs of Fructification with their Envelopes disposed according to more or less of a symmetrical plan; while the Cryptogamic plants have their reproductive organs, if any, disposed without any order, and their integuments obscured and irregular. If we look further to the parts of vegetation, we find that the Phænogamous plants are furnished with vascular tissue and with stomata, while the Cryptogamous have only cellular tissue, either during their whole life, or in their first foliaceous organs.

Phænogamous plants have been divided into *Dicotyledones*, or those which have two opposite or several whorled Cotyledons; and into *Monocotyledones*, which have only one Cotyledon, or, if more than one, they have them arranged alternately. The Dicotyledons, moreover, grow by additions of new layers on the outside of their woody texture, and are hence called Exogenous in growth, while the Monocotyledons grow by additions to their centre, and are hence named Endogenous.

Cryptogamous Plants may also be divided into two classes, the Ætherogamous, and the Amphigamous, the first signifying that the fructification is unusual, having sexual organs visible under the mi-

* Sur la Division du Règne Végétal. 1833.

croscope, but constructed upon a perfectly new plan. The *Amphigamæ* include those of which the fructification is doubtful, and such as display no sexual organs even under the microscope, though it is possible that the spores may have become fecundated even within the cells, in cases where they are produced. These Cryptogamous plants are also either *semivascular*, or entirely *cellular*. This forms the main distinction between Acrogens and Thallogens, the two groups into which Cryptogamous plants are now generally divided. The former, which are the same as the Ætherogamæ, have their first leaves formed of cellular tissue only and are without stomata; but at a later period of growth, they have vessels and stomata. The true Cellulares are entirely without vessels and stomata, and consist of a homogeneous mass, in which the distinction of stem, leaves, and roots, is obtained only by comparison. But both these groups are usually included under the general term *Acotyledones.*

Hence we observe that the divisions formed from the Organs of Reproduction correspond with those taken from the Organs of Nutrition.

The results may more clearly be represented in a tabular form, and for the sake of seeing the relative numbers of plants in each of these great subdivisions, we add the numbers of each which were known in the year 1830, as given by De Candolle.

From the Organs of Fructification.		From the Organs of Nutrition.		
I. Phanerogamæ	or	Vasculares	39,684	
Class 1. Dicotyledoneæ	,,	Exogenæ		32,264
2. Monocotyledoneæ	,,	Endogenæ		7,260
II. Cryptogamæ	,,	Cellulares	10,950	
3. Ætherogamæ	,,	Semivasculares		3,242
4. Amphigamæ	,,	Cellulosæ		7,723
			50,634	

These classes are subdivided into smaller groups, under which the several Natural Families are arranged; *v.* p. 275.

VEGETABLE PHYSIOLOGY.

The subjects which are attended to in Vegetable Physiology are, the mode in which the functions of Plants are performed, how they are enabled to grow, and how in perfecting their secretions they are influenced by the several agencies of Light, Heat, Air, and Moisture, as well as the nature of the nutriment afforded by the soil. This is interesting in a scientific point of view, and necessary to be studied, if it is wished to make any practical application of our knowledge of Plants, to the arts of Agriculture or of Horticulture, or to the cultivation of Medicinal plants. Also if we are desirous of knowing the

season of the year best suited to the collection of the different parts of plants, or wish to judge correctly of the situations in which they are most likely to secrete the principles which make them useful as Medicinal agents, in their most efficient state.

Plants not being endowed with voluntary motion, and unprovided with any *internal cavity* in which they may store up the fluids from which they are to derive nourishment, depend for these entirely on the soil in which they are fixed, and on the atmosphere by which they are surrounded. The nutriment absorbed by the aid of endosmose by the extremities of the root passes from cell to cell, or along the vascular tissue of the middle of the roots, and then, aided by capillary attraction and the void produced by evaporation from the surfaces of leaves, &c., ascends the stem chiefly in the course of the young wood; in early spring filling every part, that is, the cells, the fibres, and the vessels; but later in the season proceeding chiefly along the cells. In its course the watery fluid dissolves some of the organic matter stored up in the vegetable tissue, and is then denominated the *sap* of the plant. Arrived at the green shoots and surfaces of the leaves, which are covered with stomata, it is exposed to the influence of light, heat, and air. About two-thirds of the moisture taken up is now evaporated and exhaled; the remainder of course becomes inspissated. Some Carbonic acid is absorbed, and, as well as that obtained by the roots, becomes decomposed, the Carbon becoming fixed and the Oxygen set free.* Some water is also supposed to be decomposed, and its Hydrogen fixed; as also the Ammoniacal salts obtained from the soil are thought to furnish the supply of Nitrogen to the plant. Other decompositions also, and fresh combinations, probably take place among the elements of air and water, when the elaborated sap, consisting of fine granules floating in a limpid fluid, begins to descend by the under surface of the leaf and along the bark, composed as this is of cellular tissue, elongated fibres, and laticiferous vessels. In these the processes commenced in the leaf are probably completed, as the sap takes either a direct or a circuitous course downwards, and allows these proper juices to become deposited in the bark, or distributed horizontally by the medullary rays to the centre of the stem, thus forming the difference between young wood (Alburnum) and heart-wood (Duramen); or else the greater portion may be conveyed downwards, even as far as the root.

The proximate principles secreted by plants, though very various in nature, are found to be composed of only a few elementary principles, that is, of Carbon, Oxygen, Hydrogen, and Nitrogen; though their proportions are complex, and the equivalent numbers of the compounds high. To give a general view of the subject, these may be arranged in a tabular manner.

* Plants in the dark and at night exhale Carbonic acid and absorb Oxygen, as do seeds during germination, and flowers during expansion, as in the Arum.

1. Compounds which contain Carbon, and Oxygen and Hydrogen in the same proportion as in water; sometimes called Hydrates of Carbon. (Ternary.)	Starch, Dextrine, Cane Sugar, Grape Sugar, Gum, Cellulose.
2. Neutral Azotized substances generally diffused through plants. Quaternary.	*Fibrine* insoluble, and *Caseine* soluble, in cold water. *Albumen*, coagulated by heat. *Gluten*, a tenacious and elastic compound of Fibrine and of an Azotized principle.
3. Ternary inflammable compounds, (containing no Nitrogen), in which Hydrogen is in excess.	Ligneous tissue, Fixed Oils, Stearine, Margarine, Elaine, Volatile Oils, (some of these contain no Oxygen, others contain Sulphur), Camphor, Balsams, Oleo-Resins, Resins, Gum-Resins, Wax.
4. Vegetable alkalis, and neutral principles, composed of Carbon, Oxygen, Hydrogen, Nitrogen. (Quaternary.)	Morphia, Narcotine, Codeia, Quina, Cinchonia, Strychnia, Aconitina, Veratria, &c. (Atropia, containing no Oxygen.)
5. Vegetable Acids. Oxygen in excess, or in greater proportion than in water. Ternary.	Citric, Tartaric, Pectic, Malic, Acetic, Tannic, Gallic, Oxalic, Meconic, &c. (Hydrocyanic acid is a compound of Hydrogen and the radical Cyanogen.)

Many acids, like the above alkalis, are peculiar to particular kinds of plants; other principles are more general, but not universal, as Colouring matter. Some products, moreover, are obtained from plants by the processes of Fermentation, by the action of Heat, or the operation of Chemical reagents.

Some of these principles are supposed to contribute more directly than others to the nourishment and growth of the plant itself. Thus Cellulose, Starch, and Dextrine, are nearly identical in composition, and one may easily be changed into the other. For the Starch, insoluble in water, may be converted into the soluble dextrine, and even into Sugar, by *Diastase*, a singular azotized substance, found in germinating seeds, also near buds and the eyes of potatoes when beginning to sprout. The Starch, before it is stored up, may thus be converted into a soluble syrup, or spread out into a membrane to form the walls of cells and vessels. The azotized principles, being generally present, are also supposed to contribute to the nutrition of the plant. They are, at all events, remarkable for corresponding in composition and properties with the principles of the same name obtained from the blood and milk of animals. By a diminution or increase taking place

in the number of equivalents of any of the elements composing these principles, there may ensue an excess of Oxygen, of Hydrogen, of Carbon, or of Nitrogen. Thus Ligneous tissue is supposed to increase its proportion of Carbon, as well as of Hydrogen, and hence to be more combustible than Cellulose. As the effects of the respiration of plants, when exposed to light, is to fix the Carbon and set free the Oxygen, this would of itself leave an excess of Hydrogen; and to this is ascribed the properties of some substances found in the descending sap of the bark, as Chlorophylle, Latex, Resins, Essential Oils, Wax. The Fatty Oils are usually secreted only by the fruit; as in the sarcocarp of the Olive, Melia, and some Palms, but they are generally confined to the kernel of the seed.

When the proportion of Oxygen is increased, acidification takes place, and the several vegetable acids are formed; some found in a great variety of plants, others peculiar to individual species. But, as in the case of the mineral acids, Hydrogen is sometimes the acidifying principle, as in Hydrocyanic acid. The formation of the oxyacids, it is supposed, is favoured by nocturnal respiration, when some Oxygen is absorbed. It takes place in parts exposed to light, but which are not of a green colour, as in a variety of fruits, and in some roots. It has further been observed that the nascent parts of plants abound in azotized principles; and though seeds contain a supply of Nitrogen, this is soon exhausted by the growing plant, and a fresh supply must be obtained from the soil, which is derived chiefly from the Ammoniacal salts held in solution by the water absorbed by the roots. In connexion with these may be mentioned the influence of the mineral contents of the soil. It is evident that as clay retains moisture, and sand allows water to percolate through it, such a mixture of the two as will hold the moisture without becoming wet, and yet allow the air to penetrate into the soil, must have a beneficial influence on vegetation. Other mineral substances, such as Gypsum, Oxides of Iron, and Alumina, are useful in fixing Carb′ and Ammonia. Some salts, being taken up by the water, must combine with the ordinary vegetable acids (No. 5), and are necessarily the source of the saline ashes which remain when plants are burnt. Some inorganic matters are essential to the constitution of the plant, as Phosphates to the grain of the Cereals, and Silex to the straw of Grasses.

Seeing, therefore, that the rate of absorption by the roots depends as well upon the moisture of the soil, as does the rate of evaporation from the leaves upon the dryness of the atmosphere, we require no further proof to perceive how much the functions of plants must be controlled by such physical agents as Light, Heat, Air, Water, and the nutriment these last afford, and how interesting and important must be the study of the functions of plants: for upon the due performance of these not only depends the proper elaboration of medicines, but of the principles which are to afford nourishment to all the vegetable feeders of the animal kingdom.

GEOGRAPHY OF PLANTS.

Having found that the growth of plants, and the nature of their secretions, are so much affected by different physical agents, we may conclude that there are particular sets of plants fitted by nature for the particular circumstances in which they are placed. The Tropical Zone is characterised by brightness of light, great heat, and moisture. These conditions are all favourable to the development of plants, which are accordingly characterized by vastness of size, their foliage by richness, and their inflorescence by brilliancy of colouring. From these regions, moreover, the rest of the world is supplied with aromatics and spices. Tropical climate is not terminated by an abrupt line; but, according to the influence of local causes, is extended into higher latitudes, carrying with it the peculiarities of tropical vegetation. As also in ascending mountains, the diminution of temperature being gradual, so is the disappearance of the vegetable forms growing at their base; and we find plants diminishing in number and in size as we ascend lofty mountains. Luxuriant vegetation, however, is not confined to tropical countries; for temperate climates can equally boast of beauty and variety of scenery, where the Pine tribe are conspicuous, Oaks with other catkin-bearing trees form valuable timber, and the small Labiatæ represent the aromatics of southern regions. Between these extremes, there are many gradations of temperature, of moisture, and of dryness, all of which influence the nature of the vegetation and the secretions of plants; as, for instance, in the tract of country which is beyond the reach of tropical influence, and yet not so cool or so moist as European regions, but where the atmosphere is clear and dry, the temperature hot, and the soil apparently barren. All this being favourable to the due secretion of vegetable products, we obtain from Persia, Arabia, and parts of Africa, many most important drugs. Therefore, in visiting or sojourning in different countries, when acquainted with the principles of geographical distribution, we know what groups of plants to expect, and what we may hope successfully to cultivate; so also in cultivating or collecting medicinal plants in our own country, we shall, by the same knowledge, be better able to weigh the influences of soil and of aspect.

MEDICAL PROPERTIES OF NATURAL FAMILIES OF PLANTS.

The connexion between the medical properties of plants and their structure was a subject noticed by Cæsalpinus, Camerarius, Petiver, and Linnæus, but has been paid much more attention to since the publication by De Candolle of his "Essai sur les Propriétés Médicales des Plantes." As the author has elsewhere said,—"In this work he has shown, that as the effects on the system of the different substances used as medicines must be owing either to their physical characters or

their chemical composition, so must these depend on the peculiar organization of the vegetable, especially in the organs of nutrition, by which they are secreted. But as plants are classified from their organs of reproduction, and not from those of nutrition, it does not appear how we are led to the nature of the secretions formed by these from a consideration of groupings founded on the examination of a different set of organs. To this it has been well replied, that though an artificial arrangement may draw its characters of classes from as small a number of organs as possible, the natural method is, on the contrary, the more perfect, in proportion as the characters of its classes express a greater number of ideas. Hence those families which present the greatest number of points of analogy in the organs of reproduction, will also display them in the organs of nutrition, in which the secretions are chiefly performed. Thus the division of vegetables from the seeds into Acotyledons, Monocotyledons, and Dicotyledons, agrees with that taken from the existence and disposition of a vascular system. Hence the structure of the organs of reproduction may be a sufficiently certain index of the structure of those of nutrition; but as these determine the nature of the secretions or products of plants, so it follows that the properties of plants may be in accordance with their classification into natural families."

As examples, we may adduce the Gramineæ as yielding all our Cereal grains. The Palms afford Starch, Sugar, and Oil. The Coniferæ, Turpentine, Resin, and Tar, in whatever part of the world they are found. The Labiatæ yield Volatile Oil; the Solaneæ secrete narcotic, the Convolvuli, cathartic, and the Gentianeæ, bitter principles, both in hot and cold parts of the world. Numerous other instances will be adduced in the course of the work. Exceptions no doubt occur; but agreements of properties with structure are so numerous, that in no other way can we get so much information, or so readily find a substitute for a medicine or an equivalent for an article of trade, as by seeking for it in the families of plants which are already known to produce substances of similar properties in other parts of the world. This is no trivial advantage, if we consider only the immense extent and varied climates of the British dominions, visited as they are by the medical officers of the Royal and East India Company's army, as well as by those of the Royal and Mercantile Navy.

THE COLLECTING AND DRYING OF VEGETABLES.

As the medical and other properties of organized bodies depend not only on the peculiar secretions of each particuliar species, (differing often in different parts or organs of each), but also on these secretions having been duly elaborated under the suitable influence of physical agents; so in the collecting of plants, we must pay attention not only to the genuineness of species and to their products, but also to the influence of Age, of Habit, of Season, of Situation, and Aspect, as well

as to their being wild or cultivated. Care must moreover be taken that their secreted principles do not become decomposed by exposure to humidity, or to too much light, heat, or air. The Colleges, therefore, give some general directions for the collecting of vegetables.

"Vegetables should be collected in dry weather, and when moist neither with rain nor dew. They should also be collected annually, and those which have been kept longer than the year should be rejected." This has reference to herbaceous plants, which should be collected only when in full perfection, that is, when they contain the principles which make them useful as medicines in the fullest perfection. The period may therefore differ according as we seek only for mucilaginous principles, or for those which present the concentrated essence of a plant in the form of an alkali.

Shortly after gathering, those which are not to be used in a fresh state should be lightly strewed, or put in paper bags, and dried as quickly as possible with a gentle heat, in a dark airy place, taking care that the green colour is not injured by too much heat; then pulverize immediately, if required in powder, and preserve in proper vessels excluded from light and moisture. Herbs and flowers for the preparation of oils and distilled waters should be used as soon as collected.

"Most Roots are to be dug up before the stalks or leaves appear." Dr. Houlton states that all roots should be taken up at the time that their leaves die, as they then abound with the proper secretions of the plant. Biennial roots must be chosen at the end of their first year. All intended to be preserved should be dried as soon as possible after they have been dug up. The large true roots, especially the more juicy, dry better in their entire state than when sliced, and their juices are not then exposed to the influence of the atmosphere. The roots which are be preserved fresh may be kept in dry sand.

"Barks should be collected at that season in which they can most easily be separated from the wood." This in general is the case in spring. The Oak is known to yield a larger quantity of Tannin when barked then, than at any other season.

Leaves are to be gathered after the flowers have expanded, and before the seeds ripen. Mr. Battley's directions are that they should be freed from their stalks before being powdered or used medicinally. But it is sometimes preferable to allow them to dry while attached to the stalks. They may then be laid in thin layers in baskets of willow stripped of its bark, in a drying-room kept quite dark. They should then be exposed to a temperature of 130° to 140° F. for 6 or 8 hours. The leaves then having shrivelled, should be turned, and the same temperature continued until they crumble readily in the hand. The leaves so dried retain their green colour, and in a high degree their medical properties. They should finally be preserved in dry and clean jars closely covered, and powdered as required. Dr. Houlton believes that the juices of leaves are less liable to deterioration by

being inspissated in their own cells than when they are formed into extracts, however carefully the process may be conducted.

"FLOWERS should be collected when just blown." But the petals of the Red Rose are directed to be gathered just before they blow.

SEEDS are to be collected when ripe, and are to be kept in their own seed-vessels.

PULPY FRUITS, if they are unripe, or if ripe and dry, are to be put in a moist place, that they may become soft;—then press the pulp through a hair sieve; afterwards boil them over a slow fire, frequently stirring; lastly, evaporate the water in a water-bath, until the pulps become of a proper consistence. Press through a sieve the pulp or juice of ripe and fresh fruits, without any boiling water being used, as in the case of the bruised pods of Cassia.

SUCCI SPISSATI. Inspissated Juices. The freshly gathered herb is to be strongly pressed through a canvass bag, in order to obtain the juice; which is to be put into a wide, shallow vessel, and evaporated in vacuo or spontaneously, especially if a current of dry air be passed over, or by the aid of steam, or a water-bath placed under it. The mass when cold is to be put into proper glazed vessels, and moistened with strong Alcohol. Sometimes the supernatant liquid, being decanted off, is alone evaporated to the consistence of an extract. These inspissated juices are not distinguished by name in the L. P. from the extracts obtained by evaporating the watery or spirituous solutions of different vegetable substances, and which form true Watery or Spirituous Extracts.

The success with which the sensible and medical properties of plants may be retained, by attention being paid to the rules for their preservation, is well exemplified in the preparations of Mr. Battley and of Mr. Squire, the extracts of Mr. Hooper (v. P. J. ii. 638 and 723), the vegetable juices of Mr. Bentley, and the dried herbs and the officinal parts of indigenous plants as preserved by Mr. J. H. Kent, surgeon, of Stanton.

TABLES OF NATURAL ORDERS OF PLANTS.

A series of Analytical Tables of the Natural Orders yielding officinal plants will now be given, in the stead of that detailed account of their several botanical characters which may be sought for in systematic treatises on Botany. The more prominent and important marks of difference between the officinal orders may, it is hoped, be clearly learnt from the following tables, and thus the space which would otherwise have been devoted to such details in the body of the work will be gained for other matters.

ANALYTICAL ARRANGEMENT OF THE CLASSES AND ORDERS OF OFFICINAL PLANTS.

Class I. Exogenæ; *v.* Dicotyledones.

Sub-class I. *Thalamifloræ.*

A calyx and corolla. Petals distinct. Stamens hypogynous.

Sub-class II. *Calycifloræ.*

A calyx and corolla. Petals distinct. Stamens perigynous, or epigynous.

Sub-class III. *Corollifloræ.*

A calyx and corolla. Petals united into one, which usually bears the stamens.

Sub-class IV. *Apetalæ.*

No corolla, and sometimes no calyx.

Class II. Endogenæ; *v.* Monocotyledones.

Class III. Cryptogamæ; *v.* Acotyledones.

Sub-class I. *Acrogenæ.*

Growing upwards; consisting of cells and vessels.

Sub-class II. *Thallogenæ.*

Growing in all directions; consisting of cells only.

CLASS I. EXOGENÆ.—SUB-CLASS I. THALAMIFLORÆ. (24.)

A. *Placentæ folial, or axile*—(*i. e.* corresponding to the united edges of infolded carpels).

- 1. Embryo small; albumen large.
  - Ovaries many, distinct.
    - Stamens indefinite.
      - Flowers quinary; *albumen horny;* seeds without an arillus . . . *Ranunculaceæ.*
      - Flowers ternary; *albumen fleshy;* seeds with an arillus . . . *Magnoliaceæ.*
  - Ovary single, compound.
    - Stamens equal to and opposite petals . . . *Ampelideæ.*
    - Stamens indefinite . . . *Canellaceæ.*
- 2. Embryo about equal in amount to albumen.
  - Sepals imbricate.
    - Flowers diœcious.
      - Sepals and petals alike; irregular in number; plants climbing . . . *Menispermaceæ.*
    - Flowers hermaphrodite.
      - Stamens free.
        - *Ovaries separated;* leaves with pellucid dots . . . *Rutaceæ.*
        - *Ovaries united;* leaves without dots . . . *Zygophyllaceæ.*
      - Stamens united.
        - Flowers regular.
          - *Corolla twisted;* ovary many-celled, with spurious dissepiments . . . *Linaceæ.*
          - *Corolla twisted;* ovary many-celled, with *no* spurious dissepiments . . . *Oxalideæ.*
          - *Corolla not twisted;* fruit a berry . . . *Meliaceæ.*
        - Flowers irregular.
          - 5 sepals, 2 interior and petaloid; corolla papilionaceous . . . *Polygaleæ.*
  - Sepals valvate.
    - Stamens monadelphous; pollen smooth . . . *Buttneriaceæ.*
- 3. No albumen in seed.
  - Calyx valvate.
    - Stamens indefinite, monadelphous; ovaries in a circle; corolla twisted; pollen rough . . . *Malvaceæ.*
  - Calyx imbricate.
    - Stamens indefinite.
      - Leaves alternate.
        - Stipules large, convolute; calyx winged, persistent . . . *Dipterocarpeæ.*
        - Stipules none, or small; calyx not winged, deciduous . . . *Ternstræmiaceæ.*
      - Leaves opposite.
        - Leaves coriaceous, without stipules; sepals persistent; stigma sessile . . . *Guttiferæ.*
    - Stamens definite.
      - Leaves dotted.
        - *Fruit syncarpous,* consolidated; stamens free, or in parcels . . . *Aurantiaceæ.*
        - *Fruit at length apocarpous;* pericarp separating into two layers . . . *Diosmeæ.*
      - Leaves without dots.
        - *Corolla regular;* fruit at length apocarpous . . . *Simarubeæ.*
        - *Corolla irregular;* fruit two-celled, syncarpous . . . *Krameriaceæ.*

B. *Placentæ parietal*—(*i. e.* corresponding to the sides, or united edges, of extended carpels).

- Placentæ opposite to carpels.
  - *Stamens* 5, with filaments extended; embryo straight, with albumen . . . *Violaceæ.*
  - *Stamens indefinite in number;* embryo curved, with albumen . . . *Cistineæ.*
- Placentæ alternate with carpels.
  - *Placentæ opposite lobes of stigma;* stamens 6; flowers tetramerous; seeds exalbuminous . . . *Cruciferæ.*
  - *Placentæ alternate with lobes of stigma;* stamens indefinite; seeds albuminous; fl. usually tetramerous . . . *Papaveraceæ.*

SUB-CLASS II. CALYCIFLORÆ. (12.)

A. *Ovary superior*—(Stamens perigynous).

Albumen absent.	Fruit a legume.			Flowers papilionaceous, or regular; odd sepal below; stamens adelphous, or free	*Leguminosæ.*
	Fruit not a legume.	Stamens many.	Fruit superior.	*Achenia, or follicles;* flowers regular; odd sepal above; stamens often indefinite	*Rosaceæ.*
				A single drupe; flowers regular; odd sepal above; stamens about 20	*Amygdaleæ.*
			Fruit enclosed by the fleshy calyx.	*A pome;* flowers regular; odd sepal above; stamens indefinite	*Pomaceæ.*
		Stamens few.		*Ovary single,* one-celled, one-seeded; sepals, petals, and stamens, usually five	*Terebinthaceæ.*
				Ovaries many, distinct or coherent; plants succulent; stamens = or twice the petals	*Crassulaceæ.*
Albumen present.				Stamens definite, opposite the petals; ovary two or more celled, few-seeded	*Rhamnaceæ.*

B. *Ovary inferior*—(Stamens epigynous).

Flowers hermaphrodite.	Albumen absent.	*Fruit of many cells, in one row;* leaves with pellucid dots, and intramarginal veins; stamens numerous	*Myrtaceæ.*
		Fruit of many cells, in two rows; leaves without dots, and no intramarginal veins; stamens numerous	*Granateæ.*
	Albumen present.	*Fruit didymous;* flowers in umbels; stamens and petals five; styles two; leaves mostly divided	*Umbelliferæ.*
		Fruit three or more celled; flowers often in umbels; styles three or more; leaves often entire	*Araliaceæ,*
Flowers diclinous.		Plants climbing; flowers quinary; anthers sinuous; fruit fleshy, one-celled, with three many-seeded placentæ	*Cucurbitaceæ.*

Sub-class III. Corolliflorae. (15.)

A. *Ovary superior*—

(Stamens hypogynous). Leaves evergreen; anthers two-celled, opening by pores; ovary many-celled; seed albuminous . . . . *Ericaceæ.*

(Stamens perigynous).

Flowers regular.	Albumen absent.				Leaves alternate; calyx imbricated; corolla plaited; stamens five; ovary two—four celled	*Convolvulaceæ.*
	Albumen present.	Placentæ parietal.			Leaves opposite; ovary one-celled, with two placentæ, many-seeded .	*Gentianeæ.*
		Placentæ axile.	Stamens free.	Stamens 2 or 4.	*Leaves opposite;* corolla four-parted; ovary two-celled	*Oleaceæ.*
				Stamens 5 or more.	*Leaves alternate;* corolla plaited, five-parted; ovary two-celled	*Solaneæ.*
					Leaves opposite; corolla valvate; ovary two-celled	*Loganiaceæ.*
			Stamens adherent.		Leaves alternate; calyx persistent round fruit; ovary two—five celled	*Styraceæ.*
Flowers irregular.	Albumen absent.				Stamens didynamous; ovaries four; flower lipped; leaves opposite	*Labiatæ.*
	Albumen present.				Stamens didynamous; ovary single, two-celled; flower variable	*Scrophularineæ.*

B. *Ovary inferior*—(Stamens epigynous).

Anthers distinct.	Leaves whorled.		Corolla rotate; fruit two-celled, two-seeded; albumen present	*Rubiaceæ.*
	Leaves opposite.	With interpetiolar stipules.	Corolla regular, stamens alternate with lobes; albumen present; fruit mostly two-celled	*Cinchonaceæ.*
		Without stipules.	*No pappus;* flowers corymbose; fruit one—five celled; albumen present	*Caprifoliaceæ.*
			Calyx pappose; corolla three—six lobed; fruit three-celled, one-seeded; albumen none	*Valerianaceæ.*
Anthers united.			*Flowers distinct;* corolla irregular, five-lobed; stamens five; fruit one—three celled, many-seeded; no pappus; albumen present	*Lobeliaceæ.*
			Flowers united on capitula; corolla ligulate or tubular; fruit one-celled, one-seeded, crowned by pappus; stamens five; albumen none	*Compositæ.*

Sub-class. IV. Apetalæ. (12.)

A. *Flowers perfect.*

Ovary superior.	Stamens hypogynous; seed albuminous.		*Stipules tubular; calyx imbricate;* fl. mostly in racemes; ovary one-celled, one-seeded, triangular	*Polygonaceæ.*
			No stipules; no calyx; stem articulated; fl. in spikes; ovary one-celled, one-seeded, round	*Piperaceæ.*
	Stamens perigynous; albumen none.	Ovary *one-celled.*	*Anthers opening by valves, two—four celled;* stigma two—three lobed. Trees	*Laurineæ.*
			Anthers opening lengthwise, two-celled; stigma undivided; calyx coloured. Shrubs	*Thymeleæ.*
		Ovary *two-celled.*	Trees; calyx membranous; fruit winged; cotyledons foliaceous	*Ulmeæ.*
Ovary inferior.	Wood without concentric zones; calyx often very irregular; stamens often gynandrous; ovary six-celled			*Aristolochieæ.*

B. *Flowers unisexual.*

Angiospermous; seed in an ovary.	Flowers in *catkins.*		Albumen none; ovary one—two celled; seeds one or many; fem. flowers sometimes solitary. Trees	*Amentaceæ.*
	Flowers not in *catkins;* ovary superior.	Ovary one-celled.	*Embryo small;* seed one, albuminous; calyx trifid, cup-shaped; stamens often united; fruit a berry	*Myristicaceæ.*
			Embryo large; seeds one—two, albuminous; fruit variable .	*Urticaceæ.*
		Ov. generally three-celled.	Calyciform involucra; often no calyx; seeds few, albuminous	*Euphorbiaceæ.*
Gymnospermous; seed naked.	Stem branched.		*Leaves linear;* stamens in catkins, one or monadelphous; seeds in axils of carpellary leaves, arranged in cones	*Coniferæ.*
	Stem simple.—*Leaves pinnate;* male flowers in terminal cones; stem cylindrical . . .			*Cycadeæ.*

CLASS II. ENDOGENÆ.

Endogenæ. (10.)

A. *With a perianth.*

Ovary superior.	Perianth coriaceous, six-parted.		Trees; leaves generally pinnate; flowers mostly unisexual, on a branched spadix.	*Palmæ.*
	Perianth coloured, six-parted.	Style undivided.	Stamens six; anthers introrse; ovary three-celled . . .	*Liliaceæ.*
		Style divided.	Stamens six; *anthers extrorse*; ovary three-celled, three-parted	*Melanthaceæ.*
			Stamens six; *anthers introrse;* ovary three-celled; lvs. net-worked	*Smilaceæ.*
Ovary inferior.	Stamens three, fertile.		Anthers extrorse; ovary three-celled; style one; bracts sheathing flowers . .	*Irideæ.*
	Stamens mostly aborted.	Anther one, with a filament.	*One loculus;* sepals three; corolla very irregular; filament petaloid	*Canneæ.*
			Two loculi; sepals three; corolla irregular; filaments not petaloid	*Scitamineæ.*
		Anthers one or two, gynandrous.	Sepals three; pet. three, irregnlar; ovary one-celled; placentæ three, parietal, many-seeded	*Orchideæ.*

B. *No perianth.*

Flowers naked.	Fl. hermaphrodite, on a simple spadix; ovary superior, one or more celled	*Acorineæ.*
Flowers glumaceous.	Fl. perfect, or unisexual; in spikelets, each surrounded by two—three series of imbricated bracts; ovary superior; seed one, albuminous	*Gramineæ.*

CLASS III. CRYPTOGAMÆ.

SUB-CLASS I. ACROGENÆ. (1.)

A rhizome, or stem, having leaves or fronds with a dichotomous venation, and generally bearing beneath them *thecæ*, or cases of spores	*Filices.*

SUB-CLASS II. THALLOGENÆ. (3.)

Growing on land; consisting of a membranous expansion; spores beneath *apothecia*, disks which burst up from the cortex	*Lichenes.*
Growing in water; leafy, cellular, or filamentous; spores in *thecæ*, or receptacles, situated in various parts . .	*Algæ.*
Growing in moist places; form diverse; spores loose, or in *sporidia*, membranous cases	*Fungi.*

Class I. DICOTYLEDONES *vel* EXOGENÆ.

Sub-class I. Thalamifloræ.

Ranunculaceæ. *Jussieu.* Crowfoots.

Ranunculaceæ are found in most parts of the world where the soil and climate are not very hot and dry. They therefore indicate moisture of soil with moderate temperature of climate.

Properties.—A few of the Ranunculaceæ secrete a bitter principle, but most abound in an acrid principle, volatile in nature and destructible by heat, which makes the leaves and roots of several useful as Rubefacients and Caustics when applied externally, or causes them to act as Irritants when taken internally. In others, peculiar Alkalis have been detected which make them useful as Sedatives, and in larger doses to act as poisons. Various species of Ranunculus, especially the indigenous R. Acris and R. Flammula, have been employed in medicine for their acrid and rubefacient properties.

Helleborus, L. E. Rhizoma et Radix. The Rhizome and Root of Helleborus Niger, *Linn.*

Black Hellebore, so called from the colour of its roots, or Christmas Rose, from flowering in winter, is a native of the shady woods of the lower mountains of many parts of Europe.

Bot. Ch. The plant is herbaceous, with a perennial blackish-coloured rhizoma, tuberculated and scaly, from which descend numerous thickish radicles. The leaves, which sometimes make their appearance after the scape, are radical, with long, cylindrical, and spotted foot-stalks, pedately divided, with the lobes from 7 to 9, oblong lanceolate, sometimes cuneate-obovate, largely serrated towards their apices, and arranged apparently along the forked terminations of the petiole; they are stiff, almost leathery, of a dirty green colour, smooth above, paler and reticulate beneath. The scape is shorter than the petiole, furnished with two or three oval bracts, often simple and single-flowered, sometimes forked and two-flowered. The flower is large, terminal, white, with a tinge of pink, the most conspicuous part being the petaloid calyx: of this the sepals are 5, ovate, and permanent. The petals, 8 to 10, are small, greenish-coloured, tubular, tapering towards the base, with the limb tubular, bilabiate, and their outer margins terminated in a tongue-shaped lip. Stamens numerous, longer than the petals. Ovaries 6 to 8. Stigmas terminal, orbiculate. Capsules follicular, leathery. Seeds many, elliptical, umbilicated, arranged in two rows. —Jacq. Fl. Aust. t. 201. B. M. t. 8.

Hellebore root is usually imported in bags and barrels from Hamburgh, and sometimes from Marseilles (*p.*). French authors state that it is obtained from Auvergne and from Switzerland. The so-called roots consist of the root-stock and of the radicles; the latter are chiefly recommended; the former, some inches long, and half an inch thick, straight or contorted, is marked with transverse ridges, being the remains of the leaf-stalks, and on the under surface with long fibres, all more or less of a dark brown colour, having internally a white point in the centre. The odour of the dried root is feeble, but has been

compared by Geiger to that of Senega root. The taste, at first sweetish, soon becomes bitter and nauseously acrid. Dr. Christison says he did not observe the roots to be acrid in February, and that the dried roots are not acrid. (Goebel and Kunze, 11. Tab. xxxi. fig. 1. a.)

Prop. Hellebore root has not yet been satisfactorily analyzed. Feneulle and Capron found in it both a Volatile and a Fatty Oil, a Volatile Acid, Resinous matter, Wax, a Bitter principle, Mucus, Ulmine, Gallate of Potash, Supergallate of Lime, and an Ammoniacal salt. They ascribe the activity of Hellebore to the union of the concrete oil with the volatile acid. As the root loses some of its efficacy by drying, and also by long keeping, it requires to be frequently renewed. Water extracts some of its virtues, but Alcohol is the best menstruum.

There are some other species of Hellebore which deserve notice.

Fig. 35.

HELLEBORUS OFFICINALIS of Dr. Sibthorp (*Fig.* 35) found by him on hilly ground in Greece and the Levant, has been figured in Fl. Græca, t. 583. It was considered by Dr. S. to be the Black Hellebore

of Dioscorides, being still used and called Zoptima by the Turks, and Σκαρφη by the Greeks. Fig. 35. 1. A sepal with petals attached. 2. Sepals, &c. removed to show the pistils with a stamen and petal.

HELLEBORUS VIRIDIS; Green Hellebore roots are often mixed with those of the Black Hellebore on the Continent, and are said to be efficient substitutes. H. FŒTIDUS, or Bearsfoot Hellebore, has its leaves still officinal in the United States. They are acrid, emetic, and cathartic, and were formerly employed as Anthelmintics. The roots of Actæa spicata are sometimes intermixed with Hellebore, and are figured with the above by Goebel and Kunze.

Action. Uses. The fresh root of Hellebore applied to the skin, induces inflammation and vesication. Given internally, it acts as an irritant to the intestinal canal, producing vomiting and purging, and in some cases inflammation of the rectum. It is Purgative and Emmenagogue.

D. Hellebore is sometimes prescribed in fresh made powder, in doses of from grs. x. to ℈j., as a drastic purgative, but in gr. iij. to viij. for milder effects. Of the infusion (ʒij. to Aq. ferv. Oj.) f℥j. every four hours. An Alcoholic extract is an efficacious preparation.

TINCTURA HELLEBORI, L.

Prep. Macerate *Bruised Hellebore* ℥v. in *Proof Spirit* Oij. for 7 days, then press, and strain.

D. fʒß. to fʒj. as an adjunct to draughts.

STAPHISAGRIA, L. E. Semina. The Seeds. DELPHINIUM STAPHISAGRIA, *Linn.* Stavesacre. *Polyandria Trigynia*, Linn.

Stavesacre is a plant of the south of Europe and of the Mediterranean islands, identified by Dr. Sibthorp as that employed in medicine by the Greeks. It is often confounded with *D. pictum* and with *D. Requienii.*

Bot. Ch. The plant is biennial, and hispid, with a tall herbaceous stem. Leaves broad palmately 5-9 cleft, segments entire or trifid, pedicels tribracteate at their base. Flowers in a lax raceme, with 5 petaloid sepals, the upper one shortly spurred, petals four, united at the base and beardless, the two upper extended into appendages inclosed within the spur, the two lower spathulate, capsules 3 ovate ventricose. Seeds numerous.—Fl. Græca, t. 508.

Prop. Stavesacre seeds are imported from the south of Europe. Those from Germany are said to be very good. All are of an irregular triangular shape, rough dotted surface, and brownish colour, of little odour, but having a bitter and acridly burning taste. The properties of these seeds depend on an alkaloid called *Delphinia*, and on a volatile acid, which has been thought analogous to the acrid principle of other Ranunculaceæ, but is perhaps only the Malic with a Volatile Oil. The other constituents are a Fatty Oil, Gum, Starch, Azotized matter, Albumen, and several salts.

Delphinia was obtained by Couerbe by acting on the alcoholic

extract of the seeds with boiling water acidulated with Sulphuric acid, and then precipitating the Delphinia from the solution by means of Ammonia. Or, boil the watery extract with Magnesia, filter the residue, boil with Alcohol, and evaporate the solution. This Delphinia is pure enough for medical purposes, but is still mixed with another substancc called Staphisin. *Delphinia* is white, powdery, but crystalline, very bitter and acrid, fusible like wax, nearly insoluble in water, soluble in Alcohol and Ether, forming salts with acids, which are also very bitter.

Action. Uses. Stavesacre seeds and Delphinia are acrid poisons; the former have been employed to kill pediculi. An Alcoholic solution rubbed on the skin produces burning and tingling; and is hence used as a counter-irritant. Internally, the seeds have been given as emetics and cathartics, but are too violent; also sometimes in infusion as Anthelmintic. In large doses, Narcotic.

TINCTURA *vel* SOLUTIO DELPHINIÆ. Dissolve *Delphinia* ℈ij. in *Rectified Spirit* f℥ij. Useful as an embrocation in Neuralgic cases, and in chronic rheumatism. Or employ the following:

UNGUENTUM DELPHINIÆ. Rub up *Delphinia* ʒß. with *Olive Oil* fʒj. and *Lard* ℥j. But the Aconite preparations are preferable.

ACONITUM, L. E. D. Radix, L. E. D. Folia, L. E. Root and Leaves. A. Napellus, *Linn.* Aconite. Monkshood. *Polyandria Trigynia*, Linn.

The name Aconitum, of Monkshood, is derived from the Greek *akonīton*, stated by Theophrastus to be a virulent poison. Dioscorides describes three or four kinds: of these, one agrees a little with the description of an Aconite, and may be *Aconitum Napellus*, Linn. found in the mountains of Italy and of Greece, where it is still known by the name of ακονιτον. It is also found in the mountainous pastures and cold hills of many parts of Europe, and is a doubtful native of this country, being sometimes found on the banks of rivers and brooks. As it is the most common species, and that alone procurable to any extent by druggists, it is retained as the officinal one, instead of *A. paniculatum*, which was formerly selected by the L. and D. P. *A. Stoerkianum*, Reich. (*A. intermedium*, Dec. and *A. neomontanum*, Willd), is supposed to have been the plant first submitted to experiment by Störk in 1762, and is thought by some to be a variety of *A. paniculatum.* But this last species has been proved by Dr. Fleming to be comparatively inert.

Aconitum Napellus is subject to a good deal of variation, whence numerous varieties and even species have been unnecessarily made. It has a tapering rootstock, with one or more lateral pyriform tubers, and erect simple stem. The leaves are divided to the petiole into five wedge-shaped lobes, which are divided into pointed linear segments. The inflorescence is a spike-like raceme with deep blue flowers. The calyx consists of 5 petaloid sepals, of which the upper one is helmet-shaped; helmet semicircular, gradually tapering to a point. Wings

hairy on the inside. Petals 5, the two upper ones converted into short sacks, which are horizontal, supported on long stalks and concealed within the helmet; the others small, linear, sometimes wanting. Filaments of stamens hairy with cuspidate wings. Ovaries 3, when young diverging. Follicles with numerous three-sided seeds which are plicato-rugose at the back.

A. paniculatum may be distinguished by its more diffuse and spreading inflorescence, and by the more elongated helmets of its flowers.

The *A. decorum*, Reich., or Giant Monkshood, is cultivated at Mitcham in Surrey, as well as several varieties of the common species. *A. ferox*, which grows on the Himalaya mountains in India, appears to contain a larger quantity of the active principle than any of the European plants.

Prop. The roots of Aconite, as seen in commerce, are of a tapering form, something like those of the carrot, of a dark brown colour externally, and white internally. The name has been derived from the resemblance of its roots to the napus or *navet*, the French turnip. Sometimes the lateral tubers remain joined to the root. They are of a lighter colour, smooth, and of a fleshy texture. The taste is first bitter, then biting, and followed by tingling and numbness in the lips and tongue, which is shortly extended to the throat. These tubers form the roots or root-stocks of the following year, and are in perfection when the plant has done flowering. The leaves, flowers, seeds, &c., all have similar properties, producing, when applied to the surface or tongue, warmth, tingling, and numbness. This property is possessed by the leaves from their first appearance till the seeds begin to form: but when these are ripe, it is entirely lost. (Geiger and C.) The seeds are then intensely acrid. The leaves and tubers ought, therefore, to be gathered when the flowers begin to fade, and the root-stocks early in autumn. These may be cut into thin slips and dried with care at a low temperature. Both will retain their properties unimpaired for a considerable time. (v. Fleming on Aconitum Napellus.)

Chem. Though Aconite has been so long employed as a medicine, its chemical composition is yet imperfectly known. An acrid volatile principle has been indicated by several chemists, though its real nature has not been ascertained. The discovery of the alkaloid, Aconitina, was made by Brandes, and confirmed by Geiger and Hesse. Dr. Pereira ascribes the acrid principle to the decomposition of Aconitina, and this seems probable, from an inert extract being produced when too much heat is employed. A peculiar acid, the Aconitic, said to be identical with Equisetic acid, has been indicated by Peschier. Besides these, there is some extractive matter, albumen, a greenish wax, mannite, and some vegetable acids and salts,—among the latter the Aconitate of Lime is most abundant.

Action. Uses. Aconite is a powerful poison, a direct Sedative of the nerves of Sensation, and useful in Antiphlogistic treatment. When a

small piece is chewed, the flow of saliva is increased, and heat and tingling, followed by numbness, are experienced. Useful in Neuralgia, Rheumatism, and Diseases of the Heart.

D. Aconite leaves lose $\frac{5}{6}$ of their weight in drying, and may be prescribed in powder, in doses of gr. j.—gr. ij. gradually increased; but are uncertain.

Extractum Aconiti, L. E.

Prep. L. Take fresh leaves of *Aconite* ℔j. and bruise them in a stone mortar; then express the juice, and without straining evaporate to a proper consistence.

This should be nearly an expressed juice of the plant, evaporated. It is, however, an uncertain preparation, and only slightly acrid, but when well made, causes numbness and tingling.

D. gr. j.—ij. gradually increased.

E. Take fresh leaves of *Monkshood* any convenient quantity; beat into pulp; express the juice; subject the residue to percolation with *rectified spirit*, so long as the spirit passes materially coloured; unite the expressed juice and the spirituous infusion: filter: distil off the spirit; evaporate the residue in the vapour-bath, taking care to remove the vessel from the heat so soon as the due degree of consistence shall be attained.

As the active properties of the plant are easily removed from the pulp by rectified Spirit in the process of percolation, this spirituous extract is strongly acrid, and energetic. Its properties were ascertained by M. Lombard of Geneva, who recommended the Spirituous Tincture and this Extract of the plant. A preparation called *Succus Aconiti* is much used. It is prepared by the addition of rectified spirit to the fresh juice of the leaves. An *alcoholic extract* is sometimes made by the evaporation to dryness of the following tincture.

Tinctura Aconiti, L.

Prep. Macerate *Aconite Root* coarsely powdered, ℥xv. in *Sp. Rect.* Oij, for 7 days, then press out, and strain.

Tinctura Aconiti Radicis, D.

Prep. Macerate *Aconite Root*, dried and cut small, ℥x. in *Sp. Rect.* Oj, for 14 days. Strain, express, and filter.

Dr. Fleming has made numerous experiments on the effects of Aconite, and prefers the following tincture for internal administration.

Macerate *Root of A. Napellus*, carefully dried and finely powdered, ℥x. Troy, in *rectified spirit* f℥xvj. for four days; then pack into a percolator; add *rectified spirit* until f℥xxiv. of Tincture are obtained.

It is beautifully transparent, of the colour of sherry wine; the taste is slightly bitter, followed by a sensation of tingling and numbness.

D. ♏iij. or ♏v. three times a day, and only to be very gradually, if at all increased. A very valuable preparation, if applied externally by brushing it on the surface, or rubbing it with the finger, or with a

sponge tooth-brush. It must be borne in mind that these three preparations differ in strength, that of the L. P. being the weakest, and Dr. Fleming's the strongest of the three. Each of them, moreover, varies in strength, according to the quantity of alkaloid contained in the root employed.

Aconitina. Both the juice and tincture of Aconite are occasionally given without any effect at all. On the other hand, two cases of poisoning by small quantities of the tincture have lately occurred. These different results are probably dependent upon variations in the amount of the active principle in the root used. This principle is the alkaloid Aconitina, which, when prepared fresh, is the most potent preparation of the drug, and the only one which is constant in strength. But so difficult has its preparation been found, that the Aconitina commonly sold both in England and on the Continent is inert and useless, and the London College, instead of inventing a better formula than the one which they prescribed in the L. P. of 1836, have preferred altogether to omit the alkaloid, and substituted for it the tincture. The alkaloid prepared by Mr. Morson of Southampton Row is pure, but it is sold at a high price, and its mode of preparation is unknown.

The Author is much indebted to Mr. F. W. Headland, of Guildford Street, for the following account of a mode of preparation adopted successfully by him, as compared with that of the late Pharmacopœia, and of the properties of the alkaloid so prepared. Specimens of Aconitina, obtained by two different processes, were exhibited by Mr. H. in the Indian Department of the Great Exhibition.

Being anxious to discover a mode by which the pure alkaloid of Aconite might be prepared in considerable quantity, and wishing to obtain such a specimen of the root as would be likely to yield it in the largest amount, I obtained from Dr. Royle a sufficient quantity of the root of the Aconitum Ferox, imported from India. On this a series of experiments was made in the Chemical Laboratory of King's College, which resulted in the adoption of the following formula of preparation as the most satisfactory and the most productive of those that were tried.

Take of the root of *Aconitum ferox,* coarsely bruised, 2 pounds; and 3 gallons of *rectified spirit.* Boil the Aconite with a gallon of the spirit for an hour in a retort with a receiver adapted to it. Pour off the spirit. Boil the residue with another gallon, and with that which distilled over. Pour off again; and do the same a third time. Press the root, and mix the solutions. Filter. Distil off the spirit from the tincture thus obtained until this is of the consistence of thin syrup. Then pour it out of the retort, and mix with twice its bulk of *distilled water,* and excess of *Sulphuric acid.* Filter carefully from the precipitate produced, until it is quite clear. Then again evaporate gently in a water-bath to the consistence of syrup. Pour this syrupy liquid, which should not exceed two fluid ounces in measure, into a stoppered bottle of which it shall occupy about one-third. Add then an excess of strong solution of *Ammonia,* and shake gently. To the white mass produced add an equal bulk of pure *æther.* Insert the stopper tightly, and, holding the bottle in a damp cloth, with a finger on the stopper, shake briskly for a few minutes. Allow then a sufficient time for the æther to rise above the water, and when it has completely separated, remove the stopper, and take up carefully the æthereal solution from the surface of the water with a pipette or common glass syringe. Pour it into an open basin. Again

shake up the watery solution with another equal bulk of *Ether*, and remove this in the same manner. Do the same a third time. Let the ethereal solution evaporate spontaneously. The Aconitina is deposited.*

This process is quick and certain; it is not difficult; but great care should be taken throughout, on account of the very dangerous nature of the product. The explanation is simple. It is probable that the alkaloid exists in the root in combination with Aconitic acid. This Aconitate of Aconitina is dissolved out by the spirit. When the tincture is evaporated, and a small quantity of water added, a number of resinous and other matters insoluble in water are precipitated. By the Sulphuric acid added at the same time a Sulphate of Aconitina is formed, which is probably more soluble than the natural salt. On the subsequent addition of Ammonia, the Aconitina is precipitated. If there is much of the alkaloid present, the solution will become opaque and semi-solid on account of its precipitation. But the Ether which is then added dissolves entirely the precipitated alkaloid, carrying it with it to the surface of the water, and leaving behind in the latter the sulphate of Ammonia and other substances.

The Aconitina thus prepared is transparent and vitreous in appearance, and of a very light yellow colour, like good Gum Arabic. With the exception of this tinge of colouring matter it is quite pure. If required white, it may again be dissolved in a small quantity of acid and water—precipitated by Ammonia—and extracted by Ether, as before. But some portion will be lost by so doing, and there will be no increase in the medicinal virtue of the product. It is a very potent medicine, and answers to the description given below.

The object of the several precautions and steps of the process will be best seen in a comparison with the formula of the L. P. of 1836. When the root of *A. Napellus* is used, the mode of preparation will be the same; but as the yield is less in amount, it will probably be most economical to employ the Indian root when it can be obtained.

Prep. L. P. 1836. Take dried and bruised *Aconite Root* ℔ij., boil it with *Rectified Spirit* Cj. in a retort with a receiver adapted to it, for one hour. Pour off the liquor and again boil the residue with Cj. of *Rectified Spirit*, and *with that recently distilled*, pour off that also. Let the same be done a third time. Press the Aconite, mix all the liquors, strain and distil. Evaporate the residue to the proper consistence of an extract. Dissolve this in *Aq.*, strain. Evaporate the liquor with a gentle heat, that it may thicken like syrup. To this add *dil. Sul′* mixed with *Aq. dest.* q. s. to dissolve the Aconitina. Drop in *Sol. Ammonia* q. s. and dissolve the Aconitina precipitated in *dil. Sul′* and *Aq.* mixed as before. Then mix in *Animal Charcoal* q. s. frequently shaking for ¼ hour. Strain again, drop in *Sol. Ammoniæ* q. s. to precipitate the Aconitina. Wash and dry it.

This mode of preparation has proved generally, if not invariably, unsuccessful, even in skilful hands. It will be seen that the process which I have recommended above differs from this formula in several particulars, viz.—

* There is no doubt that the native root contains a much less and more variable quantity of the alkaloid than the Himalayan Aconitum Ferox, so named on account of its highly poisonous properties. Even in the last the quantity is sufficiently small to be lost by a bad formula of preparation. The Indian root is thick, tap-shaped, and without rootlets; brown outside and white within. There are two different kinds, which may easily be separated by sorting. One, which I suppose to have been collected about the commencement of the Himalayan season, is heavy, of a dense horny texture, and contains a large quantity of starch. The other is light and friable, with a powdery or chalky appearance. It seems to contain the same amount of alkaloid in the same bulk as the other contains, and being of less specific gravity, is much more valuable as regards weight. I found in several experiments, the results of which were very uniform, that while from 54 to 56 grains of Aconitina could be obtained from 1 pound of the horny root, 88 to 92 grains were extracted from a pound of the friable root. The proportion is about 3 to 5. These experiments were made in the summer of 1849.—F. W. H.

1. In the evaporation of the spirituous solution to a thin syrup instead of to an extract.

2. In avoiding the precipitation, filtration, and washing of the alkaloid, which is twice repeated in the other process.

3. In dispensing altogether with the use of animal charcoal.

(1.) In using more heat there would be a danger of charring or decomposing the product. But probably Aconitina is no more liable to such destructive decomposition than other alkaloids. It has been supposed that it is decomposed even by the heat of boiling Alcohol, and that this is the cause of the freqnent failures in its preparation. But this is certainly not the case. I have prepared it in several other ways,—as by boiling Ether upon the root,—and by macerating it in spirit maintained for several days at a temperature of 180° Fahr. In each case the product, both chemically and medicinally, was identical with the alkaloid prepared as above. I have also boiled the latter in water for a considerable time, and found it to be unaltered.

(2.) But a most important cause of failure in the old process consisted in the large quantity of water employed, and the repeated solution of the product. For Aconitina is soluble to a considerable extent in water, 1 part being dissolved by 150 parts of the latter. I have found in the old process that even when the precipitate is well washed there remains afterwards some adherent sulphate of ammonia, by which the alkaloid is rendered deliquescent. This cannot even be removed by solution in Alcohol, so that it is necessary to wash again with water, by which a great part of it is lost. These difficulties are avoided by the Ether-method. The water from which the alkaloid is precipitated should be very small in amount, so that on the addition of Ammonia the solution becomes semi-solid. It would not be possible to lose much by solution in this amount of water. But supposing it to be only 4 ounces, it would dissolve at least 12 grains of Aconitina. If the *A. Napellus* were used, this would probably be the whole quantity. I have found that the Ether not only dissolves the alkaloid precipitated, but also the greater part of that which remains dissolved. So that after the third Ether-washing the water retains scarce any active or poisonous properties. As Sulphate of Ammonia is perfectly insoluble in Ether, the alkaloid is obtained quite dry in this way.

(3.) Had any Aconitina been forthcoming by the old process, which was highly improbable, and very rarely, if ever, proved to be the case, it was next to be decolorized by the use of Animal Charcoal. This substance has not only an attraction for colouring matters, but exhibits also a remarkable affinity for vegetable alkaloids, abstracting them from the solutions in which they are contained. This I believe to be particularly the case with Aconitina, and it is a serious cause of loss in the preparation of an alkaloid which is obtained in such small quantities as this is. If 10 grains of the coloured alkaloid be dissolved in water acidulated with Sulphuric acid, and mixed with Animal Charcoal sufficient to decolorize it, and if, after standing and filtration, the liquid be concentrated, and Ammonia added in excess, the product will be found to be very much reduced in amount. In more than one experiment I have found that there is none left at all.

So that the causes of failure in the old process are—the large amount of water employed in the process of precipitation and subsequent washing—the use of Animal Charcoal in decolorization—and perhaps also, the heat necessary to reduce the spirituous solution to an extract.

Properties. Aconitina, prepared as above, is, when perfectly purified, white and inodorous. If dried after precipitation from water, it is chalky and friable; when obtained by the evaporation of its alcoholic or ethereal solution, it is transparent and horny. I have not been able to obtain it in crystals of any kind whatever. It is soluble in 150 parts of water; very soluble in alcohol, and still more so in ether. The solution has a bitter and somewhat sweetish taste, which is followed by heat, tingling, and numbness of the tongue. It has a faintly alkaline reaction. The alkaloid is not a powerful base, but with the mineral and vegetable acids it readily forms salts, which are also amorphous, much more soluble in water than itself, and possess similar properties. The

solution of one of these salts gives a white precipitate with a solution of Bichloride of Platinum, a yellowish one with Terchloride of Gold, and yellowish-brown with free Iodine. Aconitina, when strongly heated, is decomposed, evolving free Ammonia, and at length entirely dispelled.

Mr. Philips supposed that the Aconitina generally obtained is mixed with another less active or inert principle, which he called Anemonin, and which differs from it in being more soluble in water. This does not appear to be the case with the alkaloid which I have prepared. I prepared some by precipitation, filtration, and washing with water. This, being brought in contact with a large quantity of water, ought, if the above view were correct, to contain more of the insoluble part, and thus be stronger and more active than that obtained by the Ether-process. But I found on experiment that, as nearly as could be judged, the very same amount of each was required, whether to poison an animal or to produce an effect on the skin.

Aconitina possesses the properties of Aconite root in a high degree. It is mainly employed in medicine for the numbing effect which it produces on the superficial nerves. By this it is rendered highly useful as a remedy for Neuralgia, particularly Tic-douloureux of the face, in which case a preparation of the alkaloid rarely fails to afford relief. Very small doses have been given internally with advantage in the case of acute Rheumatism, as a sedative. Larger doses are very poisonous. From the effects produced on animals, Mr. Headland calculates that $\frac{1}{10}$ of a grain would be certainly fatal to an adult man.* The application of the ointment to the conjunctiva or the forehead is followed by contraction of the pupil of the eye. For the medicinal application of the Aconitina prepared as above, Mr. Headland recommends the following formulæ.

Unguentum Aconitinæ.

Prep. Take *Aconitina* gr. ij., and *Ceratum Cetacei* ℥j. Mix thoroughly.

Ung. Aconitinæ Fortius.

Prep. Take *Aconitina* gr. iv., and *Cerat. Cetacei* ℥j. Mix thoroughly.

Liquor Aconitinæ.

Prep. Dissolve *Aconitina* gr. j. in *Rectified Spirit* f℥j. Add *Distilled Water* f℥ix. Each fluid-drachm contains 1-10th of a grain, and each drop 1-600th.

Lotio Aconitinæ.

Prep. To *Liquor Aconitinæ* f℥x. add *Glycerine* f℥ij.

A small quantity of the mild ointment, or f℥ß of the Lotion, rubbed on to the side of the face in a case of Neuralgia, soon produces numbness, lasting for several hours or a whole day. The strong ointment may be used to cause a rapid and powerful effect. When the alkaloid is pure, and prepared as above, these proportions should be adhered to. For 2 grains here ordered, Dr. Fleming used 16, while Dr. Turnbull and Mr. Phillips recommended 8. The *Liquor Aconitinæ* is intended for internal use, and is much more certain and exact than the usual preparations of Aconite. In cases of acute Rheumatism or Heart-disease, ♏v.—xij. (*i.e.* 1-120th—1-50th gr. Aconitina) may be given at a dose.

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* "Essay on the Action of Medicines," Chap. IV., *Art.* Aconite.

MAGNOLIACEÆ, *Dec.* Magnoliads.

The species occur in a scattered manner in America, China, Japan, New Holland, and New Zealand. Many of these are remarkable for their aromatic properties, in consequence of the secretion of a volatile oil. The *Star-Anise,* a fruit so called from being arranged in a stellate manner and having the taste and odour of Anise, is well known in the East by the name of *Badian.* This name, having been introduced into Europe, has given origin to the term Badianifera. Star-anise is the fruit of *Illicium anisatum,* a native of China, or, according to Siebold and Zucc. of *I. religiosum,* which may be only a variety of the former.

DRIMYS WINTERI, *Dec.* Cortex. Winter's Bark. *Polyandria Tetragynia*, Linn.

Winter's Bark is the produce of the Drimys Winteri (fig. 36), and was first brought to Europe by Capt. Winter, after a voyage to the

Fig. 36.

straits of Magellan, in 1579. On account of its aromatic and stimulant properties it has been used as a substitute for Cinnamon. Being also tonic, it resembles Canella bark. It is now seldom employed.

MENISPERMACEÆ, *Dec.* Moonworts.

The Menispermaceæ, being anomalous in some characters, are considered by Dr. Lindley as more closely allied to Smilaceæ among Endogens. The plants of this family are confined chiefly within the tropics, both of Asia and of America; a few straggle beyond those limits, and some are found on the coasts of Africa.

Prop. The Menispermaceæ secrete a bitter principle along with a large proportion of starch both in their roots and stems. Many of them are internally of a yellow colour; an acrid principle is occasionally found, especially in the fruits of some species. Hence some are useful as Tonics and Demulcent Diuretics. Cocculus indicus is poisonous.

PAREIRA, L. E. D. Radix. Cissampelos Pareira, *Linn.* Velvet Leaf. *Diœcia Monadelphia.* Linn.

PAREIRA is the root of a climbing plant, indigenous in Brazil, called *Pareira brava*, or Wild Vine, and Velvet Leaf in some of the West India islands. It was first made known by Marcgraf and Piso in their works, Hist. Nat. and Hist. Rer. Nat. 1648, by the name of Caapeba, the Portuguese call it Erva de nossa Senhora, and Ray mentions it in 1688, as "contra calculum excellentissima est." The root,

Fig. 37.

and also the stem, not only of this, but of other species, are employed. Aublet states, that the roots of *Abuta rufescens* pass for and are employed as White Pareira in Cayenne, and that Red Pareira is yielded by a variety of the same. Auguste St. Hiliare gives *Cissampelos glaberrima* as yielding the original Pareira of Brazil, where Martius states it is called Capeba and Sipo de Cobras.

Cissampelos Pareira (figs. 37 and 38), like others of the genus, is diœcious, with round and smooth, or downy, twining stem. Leaves roundish, peltate, subcordate, aristate, smooth above, the under surface covered with silky pubescence. Flowers small, racemose, (fig. 37). Racemes branched, with small bracts. Peduncles solitary, or in pairs, flowers hispid, (fig. 37, 1, fig. 38, 2). Sepals 4. Petals 4, united into a cup-shaped corolla. Stamens monadelphous with the 2

two-celled anthers opening horizontally at the top, (fig. 38, 1). Racemes simple, with broad foliaceous bracts. Calyx, of one lateral sepal, with one petal in front of it, (fig. 37, 3). Ovary solitary. Stigmas 3. Drupe hispid, scarlet, obliquely reniform, not compressed, wrinkled round its margin. Seed solitary uncinate. Embryo (fig. 37, 2 and 38, 3) long, roundish, enclosed in a fleshy albumen.

Fig. 38.

Pareira-root is found in commerce in pieces varying from a few inches to a foot in length, of different thicknesses, tortuous, more or less cylindrical, of a dark brown colour, furrowed longitudinally, exhibiting on the transverse section a number of concentric rings (but which are sometimes very *eccentric*), and rays radiating from the organic centre. The root is without odour, and the taste is sweetish, with some aroma, and afterwards bitter. Some of the kinds found in shops are without any sweetness.

Chem. It contains resin, a yellow bitter principle, a brown-coloured matter, vegetable mucus, starch, nitrate of potash, with some other salts. (*Feneulle.*) Wiggers has announced a peculiar vegetable alkali, of a sweetish-bitter taste, which he has called *Cissampeline*. The active and useful properties seem to depend on the Bitter principle, Starch, and Nitrate of Potash.

D. and Adm. In powder, ℈j.—ʒj. A good form is the infusion, to which some of the extract may be added. The use of the Decoction was first advised by Sir B. Brodie. Dr. Christison recommends "a solution obtained with cold water by percolation, as in the Edinburgh formula for obtaining the extract; because the product, as it does not contain the starch of the root, is less apt to decay." The decoction has been introduced in the last edition of the L. P.

DECOCTUM PAREIRÆ, L. Decoction of Pareira brava.

Prep. Take *Pareira root sliced* ℥x., and *Dist. Water* Oiß. Boil down to a pint, and strain.

D. f℥j.—f℥iij.

Action. Uses. Mild tonic and demulcent diuretic.

INFUSUM PAREIRÆ, E. D. Infusion of Pareira brava.

Prep. E. Macerate *Pareira* ʒvj. in *Boiling Aq.* Oj. for 2 hours in a covered vessel and strain through linen or calico. D. Similar.

EXTRACTUM PAREIRÆ, L. E. Extract of Pareira brava.

Prep. L. Macerate bruised *Pareira* ℔ijß. in boiling *Aq. dest.* Cij. for 24 hours, boil down to Cj., strain while hot and evaporate to a proper consistence. E. To be prepared like Extract of Liquorice.

CALUMBA, L. E. D. Radix, L. E. D. Cocculus palmatus, *Dec.* The Calumba plant. *Diœcia Hexandria*, Linn.

Calumba-root was first made known as a medicine by F. Redi about 1677. Semedus mentioned it before 1722 among medicines from India. In works on Materia Medica in use in India, it occurs by the name of *Kalumb.* Dr. Berry first ascertained that it was the root of a plant (of which he figured the male) inhabiting the forests on the coast of Mozambique and Oibo in Eastern Africa, but where it is never cultivated. Sir W. Hooker in 1830 described and figured both male and female plants, from plants introduced by Capt. Owen into the Isle of France. Figs. 39 and 40.

The Calumba plant has a perennial root with several spindle-shaped fleshy tubers, (7) filled with longitudinal fibres of vessels, which are externally brown, with transverse warts, and internally of a deep yellow colour, devoid of smell, but very bitter. The stems are annual, herbaceous and twining, covered with glandular hair, hairy below. Leaves alternate, nearly orbicular, cordate at the base 5—7 lobed, lobes entire, wavy on the surface and margin, acuminate, hairy with long petioles. Racemes axillary. Flowers small, diœcious, green. Calyx of 6 sepals in two series with bracteoles. Petals 6, (1, 2) obovate half enclosing the 6 opposite stamens. Anthers terminal, 2-celled, dehiscing vertically. Ovaries 3 (3) united at the base. Drupes (4) or berries about the size of a hazelnut, densely clothed with long spreading hairs, tipped with a black oblong gland. Seeds (5, 6).—Bot. Mag. t. 2970-71.

Calumba, in its officinal form, consists of transverse sections (8) of the root and its lateral tubers, which are flat, circular, about $\frac{1}{4}$ to $\frac{1}{2}$ an inch in thickness, and from $\frac{1}{2}$ to 2 or 3 inches in diameter. The cortical portion is 2 or 3 lines in thickness, covered externally with a brownish-coloured cuticle; the faces are of a greyish-yellow colour; the interior portion in concentric rings, easily distinguishable from the cortical, is soft, almost spongy, thinner towards the centre from shrinking there. The root is brittle, and therefore easily pulverized; the powder of a greenish yellow tinge; its taste is bitter and mucilaginous, with a slightly aromatic odour. G. and K. ii. tab. v. fig. 5.

Chem. Calumba-root consists of one-third of starch, a yellow-coloured bitter substance (*Calumbine*), mucoid matter (Planche), resinous extractive (Buchner), a trace of volatile oil, &c. Calumbine was first obtained pure by Wittstock. When pure, it is colourless, but intensely bitter; it crystallizes in rhomboidal prisms, melts like wax; it is little soluble in water, but is dissolved by Alcohol or Ether, and by acids as well as alkalis, Acetic acid being the best solvent. Its composition is said to be C 65·45, H 6·18, O 28·37, or $C_{12}H_7O_4$.

Fig. 39.

Calumba, when good, breaks easily, and, from the abundance of starch, gives a blue colour with tincture of Iodine. Neither Sesquichloride nor Sulph. of Iron produce any change, as it contains no Tannin; neither do Emetic Tartar or Gelatine, showing absence of Gallic acid. Infusion of Galls gives a greyish precipitate. (*p*).

Calumba-root is sometimes adulterated with American or False Calumba, of which the infusion becomes dark green with the Sesquichloride of Iron; also with Bryony-root, which is distinguished by a permanent bitterness of taste with acridity. A considerable quantity of an article called *Calumba-wood* was imported from Ceylon about two years since. It displays the peculiar structure of a Menispermaceous stem. As the true Calumba-plant does not grow in Ceylon, it appears likely that this wood may be the product of the *Menispermum fenestratum* Gærtn, *Coscinium* of Colebrooke, which is said by Ainslie to be in common use as a tonic among the Cingalese.

Action. Uses. Stomachic and mild Tonic powder. gr. x.—ʒß twice or thrice a day.

Infusum Calumbæ, L. E. D. Infusion of Calumba.

Prep. L. Macerate *Calumba* sliced ʒv. in boiling *Aq. dest.* Oj. for two hours, and strain. D. Made with *Cold Water;* 1-5th stronger. E. Made by percolation with *Cold Water,* 1-5th weaker than L.

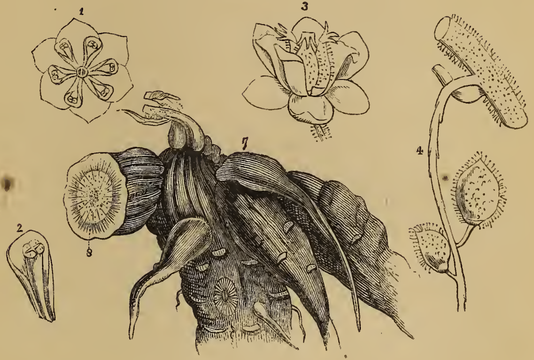
D. f℥iß. twice or thrice a day. It soon undergoes decomposition.

Tinctura Calumbæ, L. E. D. Tincture of Calumba.

Prep. L. Macerate *Calumba* sliced ℥iij. in *Proof Spirit* Oij. for 7 days, then press, and filter. E. Similar: made by percolation. D. Stronger; ℥v. to Oij.

D. fʒj.—fʒij. as an adjunct to bitter draughts and mixtures.

Fig. 40.



Cocculus Indicus, E. Fructus. The Fruit. Anamirta Cocculus, *Wight and Arnott.* (Cocculus suberosus, *Dec.*) The Cocculus Indicus plant. *Diœcia Monadelph.* Linn.

Cocculus Indicus is the fruit of a climbing plant common in the mountainous parts of the Malabar coast, whence our supplies, and they are large, are now all derived through Bombay, Madras, and Ceylon. But formerly these berries reached Europe by the Red Sea and the Mediterranean, whence they were called Grana Orientis by Ruellius, 1536, Coque du Levant, by Pomet, &c. There is no proof, though it is probable, that they were known to the Arabs. The Mahizuhra (Fish-poison) of Rhases, Serapion, and Avicenna, and referred by Sprengel to these berries, seems to have been a plant and its bark, "qua juvat in doloribus juncturatarum et contortione digitorum." (Serapion.) Plempius coined the name *Ichthyoctonum*, to indicate "fish-poison." The plant yielding these berries was ascertained by Dr.

Roxburgh. It was named *Anamirta paniculata* by Colebrook, and subsequently *A. Cocculus* by Wight and Arnott; the latter name has been adopted by the Edinburgh Pharmacopœia. It was the *Menispermum Cocculus* of Linnæus. The name Cocculus is probably derived from the Tamul *Kakacollie*, which signifies *crow-killing*, as does the Sanscrit *kakmare.*

The Cocculus plant is a powerful climber, with ash-coloured, deeply cracked, corky bark, whence the plant was called Cocculus suberosus. The leaves are stalked, large, broad-ovate, or rather roundish, truncated or somewhat cordate at the base, acute at the apex, firm in texture, soft and downy when young, with 5 digitate ribs,—petioles a little shorter than the leaves, tumid at both ends. Flowers diœcious, in lateral compound racemes. Calyx of 6 sepals in a double series with 2 close pressed bracteoles. Corolla none. ♂ Stamens united into a central column dilated at the apex: anthers numerous, covering the whole globose apex of the column. ♀ Flowers unknown. Drupes 1—3, 1-celled 1-seeded. Seed globose, deeply excavated at the hilum. Albumen fleshy: cotyledons very thin, diverging, and each occupying a side of the hollow cavity that contains the embryo.

Cocculus berries were described by Dale as being kidney-shaped and something like bay-berries, but somewhat smaller. They are blackish-brown, and wrinkled externally, with the outer coat thin and dry, and within it is a white, woody, bivalvular shell, enclosing the whitish, semilunar, oily, and very bitter-tasted seed; which never fills the whole of the cavity, which, in old seeds, is sometimes entirely empty. "The kernels should fill at least two-thirds of the fruit." E. P.

Chem. The kernels of Cocculus indicus were analysed by Boullay; but most recently by Couerbe and Pelletier, who obtained *Picrotoxine*, Resin, Gum, Fatty acid, and a Waxy matter, Malic acid, Mucus, Starch, and Salts. In the shell they obtained two alkaloids, but in small quantity, which they called Menispermia and Paramenispermia. But the nucleus being the part used, it is necessary to notice only its active principle. *Picrotoxine* is colourless, crystallizes in needles, sometimes in silky filaments, in plates, and in rhombic prisms. (*c.*) Its taste is intensely bitter. It is soluble in 150 parts of water at 57° F., and in 25 of boiling water, in 2 of Ether, and in about 3 parts of Alcohol. It is insoluble in both the fixed and the volatile oils. It does not combine with acids, though soluble in Acetic acid, and as it forms combinations with alkalis, it is considered by some to be of the nature of an acid. It consists of $C_{12} H_7 O_5$. To obtain it, Dr. Christison recommends to separate the oil first from the kernels by expression, next to exhaust the residuum by percolation with rectified Spirit, which is then to be distilled off. The residue is agitated with boiling water and a little H Cl′. The dissolved Picrotoxine may be obtained, on the water cooling after moderate concentration.

Action. Uses. Poisonous; used for taking fish and game, and employed by unprincipled brewers for adulterating porter, being unblushingly recommended by Childe and by Maurice in their books " on

Brewing." It is used chiefly in the form of a bitter extract, known by the name of B. E., *black extract*, which is ostensibly prepared for tanners. (*v*. Cycl. of Pract. Receipts.) It produces giddiness, tetanic convulsions, and coma; applied externally, in powder, it destroys vermin, and is useful in scabies, ringworm, and porrigo.

UNGUENTUM COCCULI, E. Ointment of Cocculus Indicus.

Prep. Take any convenient quantity of *Cocculus Indicus*, separate and preserve the *kernels*, beat them well in a mortar, first alone, and then with a little axunge, till it amounts altogether to five times the weight of the kernels.

An ointment of Picrotoxine may be formed in the proportion of *Picrotoxine* gr. x. to *Lard* ℥j.

PAPAVERACEÆ, *Jussieu*. Poppy-worts.

Papaveraceæ inhabit the temperate parts of the northern hemisphere; a few are found in tropical Asia, Australasia, Cape of Good Hope, and equinoctial America. The milky juice of most of the species is acrid and narcotic.

PAPAVER, *Linn.* *Polyand. Monogynia*, Linn.

Herbaceous plants with a white juice. Peduncles 1-flowered, naked, drooping before the expansion of the flower. Sepals two, convex, deciduous. Petals 4. (Fig. 41.) Stamens numerous. (41, 1.) Style wanting. Stigmas 4 to 20 radiating, sessile upon the disk which crowns the ovary. Capsule obovate, one-celled, composed of 4 to 20 carpels united together, and opening by small valves beneath the crown formed by the stigmas. Placentæ opposite the stigmas, produced internally into spurious, incomplete dissepiments. Seeds numerous, reniform. (Fig. 41, 3, 4.)

RHŒAS, L. E. D. Petala. The Petals. Papaver Rhœas, *Linn.* Corn Poppy.

The common Red, or Corn-Poppy, is found in corn-fields and on road-sides throughout Europe, and has probably been introduced with wheat. This species or *P. dubium*, with its oblong capsules, is probably the *ῥοίας* of the Greeks. The root is fibrous, the stem many-flowered, and, like the peduncles, hispid with spreading hairs. Leaves pinnate or bipinnate, with oblong, lanceolate, jagged, toothed lobes. Petals a bright scarlet, often nearly black at the base. The filaments subulate. Capsule obovate, rounded at the base, smooth, with the margin of the 8 to 10 stigmas incumbent. The flowers expand in June and July.—E. B. 645.

The scarlet petals of this Poppy, which are officinal on account of their colour, become of a dull red colour on drying, and lose the somewhat heavy opium-like odour of the fresh flowers. "They should be dried quickly with the aid of a gentle heat and a current of air." They impart their colour to water, which is preserved in the form of the Syrup. This is supposed to have some slight narcotic properties, but is probably useful only as a colouring ingredient. This colour is blackened by alkalis, and rendered of a dark violet or brown tinge by

Sesquichloride of Iron. The Petals consist of yellow Fatty matter 12, red Colouring matter 40, Gum 20, Lignin 28, in 100 parts. (Riffard, as quoted by Dr. Pereira.)

SYRUPUS RHŒADOS, L. E. Syrup of Red Poppy.

Prep. L. *Red Corn-poppy petals* ℔j. boiling *Aq.* Oj. *Sugar* ℔iij. or q. s. Add the petals gradually to the water, heated in a water-bath, frequently stirring them; then, the vessel being removed, macerate for 12 hours, afterwards press out the liquor, strain, and finish as with Syrup of Marsh-mallow; (*i. e.* adding *rect. Spirit* f℥ß. to each f℥j.) E. Similar; no Spirit.

PAPAVER, L. E. D. Papaver somniferum, *Linn.* The Garden or White Poppy. Capsulæ maturæ, L. Capsules not quite ripe, E. Dried Capsules, D. Poppy-heads.

The term PAPAVER is applied in the Pharmacopœias to the capsules of the above plant,—which are officinal, as well as the inspissated juice, or Opium, obtained from them. It appears to have been one of the early cultivated plants, as Homer is thought to allude to it as growing in gardens. Hippocrates mentions two kinds, the *black* and *white poppy*, so the Arabs and Persians distinguish the *khuskhash abiuz* or white, from the *khuskhash aswad*, or black poppy. The white Poppy is now cultivated in the plains of India, and the black, or rather deep-red, variety in the Himalayan mountains.* It was early cultivated, as it still is, in Egypt, also in India, Persia, Asia Minor, as well as in some parts of Europe.

The Garden Poppy (fig. 41) is probably a native of Persia. It has, however, been so long grown in gardens in various parts, that it is sometimes found apparently wild, especially in the southern parts of Europe.

The plants are from 2—4 feet high, the stems are round and straight, glaucous, smooth, with a few hairs towards the white and tapering extremity and on the peduncles. The leaves are large, sessile, amplexicaul, smooth, of a glaucous green, margins wavy, cut and toothed. The flowers are large and terminal, drooping before flowering, with smooth concave sepals; 4 large petals, roundish in form, white or of a purplish colour with a darker coloured spot near the claws. The capsule is oval, or nearly globose, large, smooth, with parietal placentæ equal in number to the stigmas, which are covered with numerous white or brownish coloured, kidney-shaped seeds. Flowers in June and July, and the capsules ripen about two months later.—E. B. 2145.

Some consider that there are two distinct species instead of varieties of this plant. *P. officinale* (Gmelin) var. *album* is larger and less glaucous, with white petals and seeds, capsules ovate-globose and remaining closed under the crown of stigmas (fig. 41, 1), while *P. somniferum* (Gm.) var. *nigrum* has the flowers violet or red, seeds

* Mr. Hamilton says, "The opium is chiefly obtained from the single white poppy; I have also seen the red and purple colours, though only one is usually seen in a field. I hardly remember to have noticed any mixture of colour in one piece of ground. The kind here cultivated generally grows to a height of three feet."—Hamilton, *Travels in Asia Minor*, ii. p. 115.

black, capsules globose opening by foramina under the stigmas (fig. 41, 2).

Fig. 41.

Capsulæ Papaveris. Poppy-heads are officinal in the Ps., but the L. P. directs them to be collected when ripe, the E. P. before they are quite ripe, as in this state they contain more of the narcotic principle. The French find those from the Levant or the southern provinces of France to be more powerful than those grown in the north. The seeds (*maw* seeds) ripen notwithstanding the separation of the capsules from the plant; and as they contain much oil, its presence adds to the demulcent properties of the decoction. Some of the properties of the following preparations depend on the presence of Morphia, especially if the poppy-heads be gathered unripe.

Decoctum Papaveris, L. E. D. Decoction of Poppies.

Prep. L. Boil *Poppy Heads* bruised ℥iv. in *Aq.* Oiv. for ¼ hour. Strain. E. D. Similar; *Aq.* Oiij.

Action. Uses. A Demulcent Anodyne fomentation, applied to swollen, painful, and inflamed parts, as the eye, abdomen, joints, &c.

SYRUPUS PAPAVERIS, L. E. Syrup of Poppy.

Prep. L. Take *Poppy Heads* ℔iij. without the seeds; boil them in boiling *Aq. Dest.* Cv. to Cij. and press strongly. Boil again the strained liquor to Oiv. Strain while hot, set by for 12 hours, and boil the clear liquor to Oij. Add Sugar ℔v.; dissolve it, and make a syrup. Mix it lastly with *Rect. Spirit* f℥v. E. About ½ as strong; no spirit. (This syrup may be made well with a *cold* infusion, by which the starch is not dissolved.—P. J. ii. p. 647.)

This is an excellent anodyne and narcotic syrup, when carefully prepared; but it is apt to undergo decomposition, and is liable also to be very carelessly made, as with extract of poppies and syrup, or with laudanum and treacle, and is hence very irregular in strength, and as it is often prescribed to children, becomes dangerous in consequence of their being apt to suffer from an overdose of an opiate. Some recommend that it be prepared by percolation with cold water. It is said to be then less liable to undergo fermentation.

D. f℈ij.—f℥ß. or more for adults. ♏x. to ♏xv. for infants.

EXTRACTUM PAPAVERIS, L. E. Extract of Poppy.

Prep. L. Macerate *bruised Poppy Heads* without the seeds ℥xv. in boiling *Aq.* Cj. for 24 hours. Boil down to Oiv.; strain while hot and evaporate to a proper consistence. E. The same (caps. unripe).

This extract has long been known, being the Meconion of the ancient Greeks. It is a good substitute for opium in many cases, being thought to allay pain and induce sleep, without producing nausea, or the irritability caused by opium. M. Buchner considers that the ripe poppy-head actually surpasses the unripe capsule in its narcotic activity; only that opium cannot be procured from it on account of the inspissated nature of its juices. He therefore recommends an extract of the ripened capsules as a substitute for opium in all cases.

D. gr. ij.—gr. x.

OPIUM, L. E. D. Succus ex inciso fructu immaturo emissus, aere induratus, L. Concrete juice from the unripe capsules of Papaver somniferum, E. Opium.

Opium, obtained by making incisions into the unripe capsules of the Poppy, and inspissating the juice, seems to have been known from early times. Hippocrates is supposed to have employed it, and Diagoras condemned its use in affections of the eyes and in ear-ache. Dioscorides describes it: but opium does not appear to have been much employed until the time of the Arabs, except in the form of the confections called Mithridatica, Theriaca, and Philonium. The Arabic name *afioon*, the Hindu *aphim*, and the name *afooyung*, by which it is known in China, must all have proceeded from the original Greek name, which is itself derived from ὀπος, juice. The Sanscrit *apaynum* seems to have a similar origin.

Opium is obtained by a very simple process, consisting merely in making incisions in the evening into the capsules of the Poppy, shortly

after the petals fall off, taking care not to penetrate into the interior, when a milky juice exudes, and either concretes upon the capsule, whence it may be taken off in little tear-like masses, or earlier in the morning in a softer state. Upon this it will depend whether the grains run together, or remain separate even when pressed.* When thus collected, the opium requires nothing more than being dried in a warm and airy room, when it becomes of a brown colour, with a shining fracture, and has a strong and peculiar odour. Some opium which the author prepared in this manner in the Saharunpoor Botanic Garden in 1828–29, was pronounced by the Medical Board of Bengal to be like Turkey opium. Most of the opium made in the Himalayan mountains is similarly prepared, and is of very fine quality. Belon and Olivier describe the Opium of Asia Minor as formed by the assemblage of the small tears collected off the capsules. Dioscorides, however, describes the process as consisting in making incisions into the capsules when the dew has evaporated, collecting the juice in a shell, mixing the several portions, and rubbing them up in a mortar. Kæmpfer gives this as the Persian process, and M. Texier describes it as being adopted in Asia Minor; and it is certainly practised with the immense quantities collected in India in the provinces of Behar and Benares, and of which an excellent description has been given by Dr. Butter in the Journal of the Asiatic Society, p. 136. When this method is adopted, the mass will appear homogeneous; when it is omitted, it will appear to be composed of agglutinated tears. Both appearances may be observed in the opium of commerce. Dr. Butter describes the quantity of opium from each capsule as varying according to soil, irrigation, and to the quantity of dew which falls, but averaging about 1 gr. from each quadruple incision. The tears are of a reddish colour externally, but semi-fluid in the interior, and of a reddish-white colour. The juice is apt to be mixed with dew, and fraudulently with a little water, and will separate into a fluid portion (*passewa*), and into one which is more consistent, the former containing much the largest portion of the Bimeconate of Morphia. The whole of the day's collection is rubbed together in a mortar, so as to break down the grains, and reduce the whole to a homogeneous semi-fluid mass, which should be dried as quickly as possible in the shade, when it is called *pucka* or matured, being called *kucha*, or raw, in its former state. All samples of Opium brought for sale are submitted to a steam drying process, by which the quantity of fluid in each is easily ascertained. The Opium for the China investment contains

* In 1844 M. Aubergier made some experiments on the cultivation of the Opium-poppy in France. He found that opium obtained from the long poppy-heads yielded more Morphia than that which flowed from the round ones. That after the 1st of July, or after the capsule began to turn yellow, the percentage of Morphia in the opium diminished. He states that the object of not making the incision quite through the pericarp is that after so doing the seeds are lost. They do not ripen, and no oil can be obtained from them. The preparation of this oil is an important source of profit.

about 30 per cent. of moisture: that for medical use in India is made quite dry.

The Opiums known in European commerce have been described under the following heads by Prof. Guibourt. That collected in Asia Minor, chiefly in Anatolia, is generally all included under the head of Turkey Opium, and most of it is exported from Smyrna; some of it, however, is taken to Constantinople, whence it is re-exported to other parts of Europe. Some Egyptian is imported into this country. The Persian is scarcely known. The Indian kinds are exported to China.

Smyrna Opium, called also Levant or Turkey Opium, is generally in flattened masses, and, in consequence of its original softness, without any definite regular form; these masses weighing from a half to two pounds, and covered with the capsules of a species of Rumex. It is at first soft, of a distinct brown colour, becoming blackish and hard when dried, losing weight from evaporation of water, and having the strong and peculiar odour of Opium. When examined with a magnifier, it is seen to be composed of yellowish agglutinated tears. This is the purest kind of Opium, yielding about 8 per cent. of Morphia and 4 per cent. of Narcotine, and, on an average, about 12 per cent. of Hydrochlorate of Morphia.

An inferior kind is, however, also imported from Smyrna, which is more apt to be adulterated, is harder, of a darker colour, appears homogeneous, and may be seen covered either with Rumex capsules, or with the leaves of the Poppy.

The Smyrna Opium is produced at several places, at from 10 to 30 days' distance in the interior; but that grown at Caisar, about 600 miles from Smyrna, is the most esteemed for its cleanness and good quality. Mr. Hamilton states that much is produced at Bogaditza: it is made into lumps about four or five inches in diameter, round which leaves are wrapped.*

Constantinople Opium, M. Guibourt conceives, may be collected in the northern parts of Anatolia. One kind is in small lenticular pieces about two inches in diameter, weighing from four to eight ounces, and always covered with a Poppy-leaf, the mark of the midrib of which may be seen on the middle of the pieces of Opium. Another variety is in large irregular cakes. Both are more mucilaginous than the

* According to M. Landerer, Smyrna Opium is prepared in the interior of Asia Minor, chiefly in Kara Chissar (Caisar), and near Magnesia. It is a compound product. The tears obtained by incisions into the capsules are allowed to flow into small shells, and dried in the sun. This opium, which is of the best quality, is mixed with an extract prepared by boiling down the fresh leaves of the poppy plant. The mass is then divided into cakes. These are wrapped in fresh poppy-leaves, and placed on shelves to dry. It is thought advantageous that, while drying, they should be exposed to the morning and evening dews. The same writer states, that it is not uncommon for Smyrna Opium to be adulterated with Salep-powder, in order to harden it. This causes the tincture to assume a slimy or mucilaginous consistence.—P. J., x. 474.

Smyrna kind, and, though of good quality, the Constantinople is less uniform in the quantity of Morphia it contains, some specimens yielding less than, and others as much as, the best kinds of Opium.

Egyptian Opium is in flattened roundish cakes about three inches in diameter, and covered with the remains of some leaf which M. Guibourt was unable to distinguish. It looks well externally, is homogeneous, has something of a reddish hue, not blackening by keeping, but softening on exposure to the air, and has somewhat of a musty smell. It is generally inferior, and M. Guibourt obtained only $\frac{5}{7}$ of the Morphia yielded by Smyrna Opium.

Persian Opium,—which Dr. Pereira calls Trebizond Opium, from his specimens having been obtained from thence. The specimens in the King's College Museum were sent by Mr. Morson, to whom M. Guibourt was also indebted. This kind is of a black colour, apparently homogeneous in texture, and in sticks some inches in length, each wrapped up in a separate piece of paper, and tied with a piece of cotton.

Some Opium has been collected in Algiers. A new variety imported from Turkey has been described by Mr. Morson (P. J. iv. 503). It resembled the Constantinople, but was soft and light-coloured; contained much wax, caoutchouc, and about $6\frac{1}{2}$ per cent of Morphia.

Besides these, some Opium is occasionally met with of European manufacture; and it might easily be produced in England if the summer were more regular. In the south of Europe the summer is probably too hot and dry. In India it can only be cultivated in the cold weather. Some good English Opium has been produced, but it is irregular in strength. The quantity of Morphia said to have been obtained from some specimens of French and of German Opium is enormous,—being from 16 to 20 per cent.

Indian Opium is not known in European commerce. The *Saharunpore Garden Opium*, sent home in 1844, is of a brown colour, shining fracture, with the strong and peculiar smell of opium, and yielded the late Professor Daniell, in one of the last analyses he made previous to his sudden and lamented death, 8 per cent. of Morphia.* The *Himalayan Opium* possesses similar sensible properties, and, though liable to be adulterated, is, when pure, of very fine quality. The *Malwa Opium* is in flat circular cakes, average weight $1\frac{1}{2}$ lb., of a rusty-brown colour, strong odour, and bitter permanent taste, varying much in quality. Some Malwa Opium lately analysed yielded only 2 per cent. of Morphia, was oily and mucilaginous, and appeared to have been

* Some specimens of this opium, prepared when the author was Superintendent of the Saharunpore Botanic Garden, sent to the Medical Board of Bengal in 1829, were pronounced to be "very fine specimens, and to resemble Captain Jeremie's in almost every particular," and Captain Jeremie's they "considered equal, if not superior, to the finest Turkey opium that comes into the market at home."

obtained by expression of the capsules. Dr. Smyttan, late Opium Inspector at Bombay, obtained from 3 to 5 per cent. of Morphia from some varieties, and from $7\frac{1}{4}$ to 8 per cent. from finer kinds. Some *Kandeish Opium* yielded to Mr. E. Solly 72 per cent. of soluble matter, and about 7 per cent. of Morphia. The E. I. Company's Opium, which is that known under the name of Bengal Opium, and which is chiefly produced in the provinces of Behar and Benares, with some in that of Cawnpore, is also of different qualities : that intended for medicinal use in the hospitals in India is of very fine quality, of a brown colour, and fine smell, packed with great care in 4 lb. and 2 lb. squares covered with layers of mica, and further defended by a case of brown wax half an inch in thickness. This Dr. Jackson, lately Opium Inspector at Calcutta, informs me is the *Patna Garden Opium*, cultivated, prepared, and selected exclusively for the Dispensary, and that it yields about 7 to 8 per cent. and sometimes more ($10\frac{1}{2}$), of Morphia. It is of this kind that Dr. Christison says, "I have examined specimens little inferior to average Turkey Opium in the quantity of Morphia they contained."

An elaborate and official account of the preparation of Indian Opium has been given by Mr. Eatwell, of the Opium Agency of Behar, and is reprinted in the Pharm. Journal for 1851, with woodcuts illustrating both the culture and manufacture. He has found Benares Opium to contain on the average 3·21 per cent. of Morphia, and 4·06 of Narcotine. The soft Opium, before inspissation, is drained of its more fluid part, or *passewah.* (P. J. xi. 361.) By this separation it is probable that a considerable quantity of the Morphia is lost.

The *Chinese Investment Opium*, which is highly esteemed by the Chinese, is made into cakes or balls, each containing about 4 lbs., and covered with a thick layer of poppy petals, made to adhere to the opium and to each other by means of a mixture of passewah and of inferior kinds of Opium and water. It is of a dark brown colour, of the consistence of an extract when first cut into, containing 70 per cent. of solid matter, and about $2\frac{1}{2}$ per cent. of Morphia.

Prop. Good Opium, when it has been some time made, is of a dark brown or blackish colour externally, and of a reddish-brown internally, either homogeneous in texture, or formed of agglutinated tears. Sp. Gr. about 3·36. The taste is strongly and permanently bitter, with some degree of acridity, and a little aroma. The odour is both powerful and peculiar. It is hard, and even becomes brittle, when it breaks with a compact shining fracture, and produces a yellowish-brown powder. Some kinds, however, are soft internally, and others never become entirely dry. The London College, to preserve uniformity of strength, directs dried Opium only to be used for the several pharmaceutical preparations. Opium is softened by the application of heat, and burns at a higher temperature. The effects of the ordinary reagents are these. Water, either temperate or warmed, dissolves about two-thirds of good opium, forms a solution of most of its active

principles, and becomes of a bitter taste and of a reddish-brown colour. Rectified Spirit takes up four-fifths of the whole mass, including all the active properties of Opium. Ether dissolves much of what is left undissolved by water. Diluted acids take up all its active principles. The alkalis precipitate them from their solutions, but redissolve them when added in excess. They are also precipitated by baryta, lime, and magnesia, and their salts, also by the soluble salts of lead and of other metals, as well as by solutions of tannin and astringent vegetable substances. As some of these are apt to be prescribed with opium, it is essential to attend to the form of exhibition, for the precipitate may contain all the active principles, and the solution be inert; or it may be made active again by using an excess of ammonia or potash; or the active principle may be taken up by the acid of some of the salts used. But these various effects of reagents can be duly appreciated only when the composition of Opium is understood.

Several analyses were made of Opium before any just ideas were obtained respecting its constitution. Derosne in 1803 first obtained a saline body. Sertürner and Seguin, the first a Hanoverian, and the second a French apothecary, both discovered in 1804 another crystallizable substance, upon which subsequent experience has proved the narcotic power of opium to depend. In a second memoir of Sertürner published in 1817, he announced his discovery of the existence of *morphia* combined with *meconic acid.* This was confirmed by Robiquet. Since then, Geiger, Beltz, Pelletier, Couerbe, Schmidtz, and Mulder, have successively analysed and shown Opium to consist of a variety of principles. Of these, three are alkaline; *Morphia*, *Codeia*, and *Thebaia*. A fourth, *Narcotine*, though neutral to colours, forms salts with acids: of this a great portion is in a free state, and may at once be separated from Opium by ether; the remainder, as well as the whole of the *Morphia* and *Codeia*, are in combination with the *Meconic* and some *Sulphuric acid* found in Opium. Two neutral principles, *Narceine* and *Meconine*, are also contained in Opium. Besides these there are four other bases or principles, about which little is known. They are found in very small quantities, and do not occur in all specimens; they are called *Papaverine*, *Opianine*, *Pseudo-morphine*, and *Porphyroxine*. Opium is said further to contain a brown acid extractive, resin, and fixed oily matters.

There is also a trace of Volatile oil (the odorous principle ?), with Gum, Bassorine, Albumen, Caoutchouc, Lignin, and Salts of inorganic bases.

MORPHIA, D. *Symb.* Mor. Fr. *Morphine.*

Morphia ($C_{35} H_{20} N O_6 = 292 + 2 Aq = 310$ when crystallized)* is found in Opium in the proportion of 2 to 8 or 10 per cent., and is

* It is right to observe that there is a considerable difference of opinion among chemists, as to the formulæ of Morphia and the other principles of Opium.

the principle upon which its medicinal properties chiefly depend. It crystallizes in shining flat six-sided prisms, but is usually in the state of a very white powder ; is without smell, but has a very bitter taste. It is very little soluble in cold water, scarcely even in boiling water, but very readily in alcohol; *i.e.* in 40 of cold anhydrous alcohol, and in 30 parts of ordinary alcohol at 212°; nearly insoluble in ether and the fixed and volatile oils. The alcoholic solution exhibits alkaline properties, when tried with turmeric; and when the spirit is distilled from it, it yields crystals, which are totally destroyed by heat; at first about 6·33 per cent. of water are expelled; with further heat, it melts into a yellowish liquid, and in the air burns with a bright flame. On the addition of Nit′, Morphia becomes first red, and afterwards yellow. Tinct. of Sesquichloride of Iron gives it a blue colour. Chlorine, and afterwards Ammonia, being added to its salts, they are rendered of a brown colour, which colour is destroyed when more Chlorine is added. With solutions containing Iodic acid, it produces a brown colour by the liberation of Iodine. Morphia is precipitated from its salts by solution of Potash (also by Ammonia and Lime-water), which, added in excess, redissolve it. It is precipitated by Tannic′, as by infusion of gall-nuts, Tannate of Morphia being formed. Morphia forms salts with S′, H Cl, and Ac′: these are crystallizable, colourless when pure, and of a bitter taste.

Prep. Morphia being combined with Meconic acid, may be precipitated from a watery solution of Opium either by Ammonia or by Magnesia, which enter into combination with the Meconic acid. It may then be separated from the other insoluble matters by the agency of alcohol. Or it may be obtained in a pure state by precipitating with an alkali the solution of one of its salts. Morphia is not officinal in the present L. P.

Prep. (L. P. 1836). Dissolve *Hydrochlorate of Morphia* ℥j. in *Aq. dest.* Oj. then add *Sol. of Ammonia* f℥v. diluted with *Aq.* f℥j. and shake well together. The precipitate is to be washed with distilled water, and then dried with a gentle heat. D. Similar.

The Ammonia, combining with the H Cl′, remains in solution, while the Morphia is precipitated, washed, and dried. The Codeia, which is usually present in Hydrochlorate of Morphia, is not thrown down by the Ammonia.

Tests. The characteristics of Morphia have been noticed above, but they can only be seen in pure Morphia. Narcotine, which is sometimes present, is insoluble in the solution of potash.

Action. Uses. Morphia possesses nearly all the action of Opium, but is less stimulating. Being, however, nearly insoluble in cold water, it is usually prescribed in the form of some of its salts, which are more certain in their operation. Both Morphia and its salts have frequently been employed endermically on the Continent.

D. gr. ¼ to gr. j. gradually increased. gr. j. in fine powder may be applied to the denuded skin.

MORPHIÆ HYDROCHLORAS, L. Morphiæ Murias, E. D. Hydrochlorate or Muriate of Morphia. Sal ex Opio preparatus: crystalli. L.

Hydrochlorate of Morphia (Mor. + H Cl+6 Aq=383) came into notice in 1831, with Dr. W. Gregory's method of obtaining Morphia. It must be distinguished, however, from what is commonly called *Gregory's Salt*, which is a compound of Muriate of Morphia and of Codeia. It is without colour or smell, is extremely bitter, in fine powder or in feathery acicular crystals, is soluble in about 16 parts of cold, and in its own weight of boiling water. This, on cooling, congeals into a crystalline mass. It is also soluble in rectified Spirit. Dil. Sul′ decomposes it, as do the alkalis. Nit′ forms with it a reddish-yellow, and Sesquichloride of Iron a bluish coloured fluid. In the present L. P. this salt is included among the Materia Medica, no formula of preparation being given. It is composed of Mor. 76·24 H Cl 9·66 Aq. 14·10=100.

Prep. It may be prepared by acting on Morphia with H Cl′, or by decomposing the Meconate of Morphia in Opium with some other salt, which shall produce an insoluble Meconate and a soluble Hydrochlorate of Morphia. The late L. P. formula prescribed Chloride of Lead. Dr. A. T. Thomson used Chloride of Barium. The E. and D. C. prefer Chloride of Calcium, according to Dr. Gregory's original process.

L. P. 1836. Macerate *Opium sliced* ℔j. in *Aq. dest.* Oiv. for 30 hours, and bruise it; afterwards digest for 20 hours more, and press it. Macerate what remains again, and a third time, in water, that it may become free from taste, and as often bruise and press it. (The Meconate of Morphia is dissolved in the successive portions of water.) Evaporate the mixed liquors, with a heat of 140°, to the consistence of a syrup. Then add *Aq. dest.* Oiij. and when all the impurities have subsided, pour off the supernatant liquor. To this add gradually *Chloride of Lead* ℥ij. or so much as may be sufficient, first dissolved in *boiling Aq. dest.* Oiv., till nothing further is precipitated. (The Chloride of Lead and water are respectively decomposed, owing to the presence of the Meconate of Morphia. The Hydrogen and Chlorine form H Cl′, which uniting with the Morphia and Codeia forms comparatively soluble Hydrochlorates of Morphia and Codeia. The Oxygen of the water uniting with the lead forms an Oxide of Lead, which combining with the Meconic′ forms an insoluble Meconate of Lead, which is precipitated, together with a little Sulphate of Lead.) Pour off the liquor which holds the Hydrochlorate of Morphia in solution, and wash what remains frequently with *Aq. dest.* Then evaporate the mixed liquors as before, with a gentle heat, that crystals may be formed. Press these in a cloth, then dissolve them in *Aq. dest.* Oj. and digest with *Animal Charcoal* ℥iß. at a heat of 120° and strain. (This is useful in depriving the crystals of colour, but by it a considerable quantity of the salt is lost:—*vide* p. 290.) Finally, the charcoal being washed, evaporate the liquors cautiously, that pure crystals may be produced.

As some Hydrochlorate of Morphia remains in solution after the first crop of crystals has been obtained, it was directed to precipitate the Morphia from this with *Liq. Ammoniæ* (leaving Codeia in solution), to dissolve the precipitate in Hydrochloric acid, again purify with animal charcoal, and obtain crystals as above.

The E. C. uses Chloride of Calcium, instead of the Chloride of Lead, and therefore Meconate and Sulphate of Lime are formed instead of the analogous salts of Lead, and, instead of using charcoal, the salt is decolorized by repeated solution, crystallization, and strong pressure in the folds of a cloth. Dr. Christison states, that it is important not to employ too much water, that about 4 times the weight of the Opium employed is sufficient to exhaust it, that the

Chloride of Lead or of Calcium should be added before instead of after concentrating the infusions, and that the evaporations should be conducted as quickly as possible, at a heat below 212°. By following this process the Edinburgh manufacturers obtain about 13 per cent. of very pure and white Hydrochlorate of Morphia from the recent soft Smyrna Opium. The D. process resembles that of the E. C.

Tests. Snow-white: entirely soluble in rectified spirit and in water: solution colourless: loss of weight at 212° not above 13 per cent. L. (100 measures of a solution of 10 grs. in Aq. f℥ß. heated near to 212°, and decomposed with agitation by a faint excess of Ammonia, yield a precipitate which in 24 hours occupies 12·5 measures of the liquid. E.) The precipitate thrown down in its solution by Nitr. Silver, is not entirely soluble in H Cl′ or N′, or in Ammonia, unless added in excess. L. These tests will detect any undue moisture, ascertain the quantity of Morphia precipitated, and the absence of colouring matter. Narcotine, if present, would be detected by not being entirely soluble in an excess of Potash by which it had been precipitated from a solution. The Hydrochlorate answers to the other chemical tests for Morphia. The commercial salt has been known to be adulterated with Salicine. This will become red on the addition of pure Sulphuric Acid.

Action. Uses. May be advantageously substituted for Opium in most cases as a sedative anodyne, diaphoretic, &c.

D. gr. $\frac{1}{4}$—gr. $\frac{1}{2}$;—a Narcotic poison in doses of gr. v.—gr. x.

LIQUOR MORPHIÆ HYDROCHLORATIS, L. D. Solutio Morphiæ Muriatis, E. Solution of Muriate of Morphia.

Prep. L. Take *Hydrochlorate of Morphia* ʒiv., *Dist. Water* Oj. and *Proof Spirit* Oß. Mix and dissolve. Each fʒj. contains 1 gr. E. D. Half as strong.

D. (L. prep.) ♏v.—xx.

SYRUPUS MORPHIÆ MURIATIS, D., contains 1 part in 18 of this solution.

TROCHISCI MORPHIÆ, E. Morphia Lozenges.

Prep. Dissolve *Muriate of Morphia* ℈j. in a little hot water. Mix it with *Tincture of Tolu* fʒiv. and *pure Sugar* ℥xxv. and with a sufficiency of mucilage form a proper mass for making lozenges; each of which should weigh about 15 grains.

Action. Uses. Sedative, &c. Much used in this or the following form in combination with Ipecacuanha for allaying cough.

D. x—xx lozenges daily. Each contains about gr. $\frac{1}{40}$ of Muriate of Morphia. Those sold in London are marked Morphia gr. $\frac{1}{24}$.

TROCHISCI MORPHIÆ ET IPECACUANHÆ, E. Morphia and Ipecacuanha Lozenges.

Prep. Dissolve and mix *Muriate of Morphia* ℈j. *Ipecacuanha* in fine powder ʒj. *Tinct. of Tolu* fʒiv. *pure Sugar* ℥xxv. and proceed as with the preceding Morphia lozenges. Useful for the same purposes.

D. x—xx lozenges daily. Each contains $\frac{1}{40}$ gr. of Muriate of Morphia, and gr. $\frac{1}{13}$ of Ipecacuanha.

MORPHIÆ SULPHAS. Sulphate of Morphia is occasionally employed in medicine. A small portion exists naturally in Opium, and it may readily be made by acting on Morphia with dil. Sul′. In the United States' Pharmacopœia there is a Solutio or Liquor Morphiæ Sulphatis. The Sulphate may be prescribed in doses of gr. $\frac{1}{8}$ to $\frac{1}{4}$, but it does not appear preferable to the Hydrochlorate, though frequently employed on the Continent, especially endermically.

MORPHIÆ ACETAS, L. E. D. Acetate of Morphia. Sal ex Opio preparatus: crystalli, L.

Vinegar has long been thought a good menstruum for dissolving the active properties of Opium, but the true Acetate of Morphia was introduced into practice by Majendie. When pure, it is seen as a colourless, snow-white powder, of an intensely bitter taste, imperfectly crystallized. It is apt to be decomposed, from some of its acid escaping, and Morphia being left, which is insoluble. Hence in prescribing it is necessary to add a few drops of Acetic acid to its aqueous solution. It is soluble in rectified spirit, readily decomposed by heat as well as by dil. Sul′, with the disengagement of Acetic acid. Its solution is rendered reddish-yellow by Nit′, and blue by Sesquichloride of Iron. It is probably composed of Mor.+Ac′+Aq.=352, or per cent. Mor. 82·95 Ac′ 14·5, Aq. 2·55=100. The L. C. places it in the Mat. Medica.

Prep. L. 1836. Mix *Acetic acid* f℥iij. with *Aq. dest.* f℥iv. and pour them upon *Morphia* ℨvj. to saturation. Let the liquor evaporate with a gentle heat, that crystals may be formed. The E. C. first obtain Morphia from Muriate of Morphia, and then dissolve it in a slight excess of Pyroligneous acid. D. Similar; the Morphia is first dissolved in *rect. Spirit.*

Tests. Very readily dissolved in water. Its other properties are such as have been stated of Morphia. "100 measures of a solution of grs. x. in *Aq. Dest.* f℥ß and *Ac′* ♏v. heated to 212°, and decomposed by a faint excess of Ammonia, yield by agitation a precipitate which in 24 hours occupies 15·5 measures of the liquid." E.

Action. Uses. Though liable to decomposition, it is preferred by some to the other salts of Morphia, in doses of gr. $\frac{1}{8}$ to $\frac{1}{4}$. A Syrup is lauded by M. Forget in doses of gr. $\frac{1}{15}$ in chronic bronchitis.

LIQUOR MORPHIÆ ACETATIS, L. D. Solution of Acetate of Morphia.

Prep. L. Take *Acetate of Morphia* ℨiv. *Acetic acid* ♏xv. *Dist. Water* Oj. and *Proof Spirit* Oß. Mix and dissolve. Each fℨj. contains 1 gr. D. Half as strong.

D. (L. prep.) ♏v—xx.

SYRUPUS MORPHIÆ ACETATIS, D., contains 1 part in 16 of this solution.

CITRATE OF MORPHIA was recommended by Dr. Porter of Bristol under the form of Liquor Morphiæ Citratis, and made by macerating

Opium ℥iv. with Citric′ ℥ij. and Aq. Dest. Oj. It does not appear necessary, as the officinal preparations of Morphia seem sufficient.

Bimeconate of Morphia. Mr. Squire, thinking it likely that the natural salt, separated from the other ingredients existing in Opium, might prove the best therapeutic agent, has prepared a solution of the Bimeconate of Morphia, which is nearly of the same strength as Laudanum. Several practitioners have borne testimony to its being less exciting than Opium, and equally if not more efficacious than the other preparations of Morphia.

Codeia ($C_{35}H_{20}NO_5=284+2$ Aq. when crystallized from Aq.) was discovered by Robiquet in 1832. Its Hydrochlorate crystallizes with the Hydrochlorate of Morphia in the process p. 309; but as the Codeia is not precipitated by the Ammonia, it may be obtained from the mother liquor from which Morphia has been precipitated by subsequent evaporation. It crystallizes in needles or right rhombic prisms, is alkaline in nature, and forms salts with acids, is soluble in water and in Alcohol, readily in Ether; insoluble in solution of Potash; does not become blue on the addition of Sesquichloride of Iron. Opium contains about ½ or 1 per cent. It has little taste; some state it to be excitant, and others hypnotic; but it resembles Morphia in its effects, only three or four times as much is required.

Thebaia, or Paramorphia ($C_{25}H_{14}NO_3=202$) is alkaline in its relations, and forms crystallizable salts with diluted acids; most nearly resembles Narcotine, but is distinguished from it by crystallizing in short needles; fuses at 302, is much more soluble in Alcohol, and is acrid and not bitter in taste, little soluble in water.

Narcotine (Anarcotina, Beng. Disp.) ($C_{48}H_{24}NO_{15}=446$) was discovered by Derosne in 1803, and its properties investigated by Robiquet in 1817. Much of it is in a free state, and may be dissolved out of Opium by Ether. It exists in the proportion of 1 to 8 per cent. It crystallizes from Alcohol in bevelled pearly tables, but from Ether in regular rhombic prisms; is white, without odour, and insipid; is insoluble in cold water and in solution of Potash, very soluble in Ether, in Alcohol, and in volatile oils; neutral to vegetable colours; combines with diluted acids, and forms salts, as the Hydrochlorate, Sulphate, &c., which are very soluble and bitter. When pure, it does not form a blue solution with Sesquichlor. Iron, nor produce a brown colour when treated with Chlorine and Ammonia. It is not reddened by Nit′, but is so by S′ containing a trace of N′. From the decomposition of Narcotine, *Opianic acid* is formed, remarkable for its affinity for Ammonia, also *Cotarnin*, &c. (Liebig.) Narcotine may be obtained by macerating the Opium which has been exhausted by cold water in the process for obtaining Hydrochlor. Morphia with weak Pyroligneous or Muriatic acid, and precipitating with Potash. It may be separated from Morphia by Ether or by

Potash,—the first dissolving the Narcotine and leaving the Morphia, while the Potash dissolves the Morphia, but leaves the Narcotine.

Action. Uses. It appears to be devoid of all narcotic properties. Dr. Roots prescribed its Sulph. in doses up to ℈j. as a substitute for the Disulph. of Quina for the cure of intermittents. It has been largely employed in India for arresting the paroxysms of intermittent and remittent fevers by Dr. O'Shaughnessy and other practitioners.

NARCEINE ($C_{28}\,H_{20}\,N\,O_{12}=298$) was discovered by Pelletier, and is in fine silky needles, which are slightly bitter, soluble in water, fusible at about its boiling point, neutral to test-paper, and not neutralizing acids. The diluted mineral acids produce a light blue (N′ a yellow) colour when brought in contact with it, as also does Iodine.

MECONINE ($C_{10}\,H_5\,O_4$ (?) $=97$) is also white, crystallizes in six-sided prisms, is acrid in taste, fuses at 194°, is soluble in water, neutral to acids. If Chlorine gas be brought in contact with it when in a fused state, a blood-red fluid is produced, which crystallizes on cooling. It is remarkable in not containing any Nitrogen.

PAPAVERINE, discovered in 1848 by Dr. Merck, of Darmstadt, bears a considerable resemblance to Narcotine, but is said to have the composition of $C_{40}\,H_{21}\,N\,O_8$.

Mention has already been made of some other basic compounds, little understood as yet, which have been occasionally found in Opium.

MECONIC ACID ($C_{14}H\,O_{11}+3\,H\,O=200$), discovered by Sertürner, was studied by Robiquet. It is seen in the form of white, transparent, micaceous scales. It is soluble in water: when this solution is boiled, it is decomposed into Carbonic acid and *Metameconic* acid, which forms hard crystalline grains. By destructive distillation of Meconic acid, another acid, the *Pyromeconic*, is produced. Mec′ readily forms salts, and is remarkable for producing a deep red colour with the persalts of Iron, and a green precipitate of Mecon. Copper with Ammon. Sulph. Copper. It may be obtained by decomposing the Mecon. Lead or that of Lime (*v.* p. 309) with dil. H Cl′.

Brown Acid Extractive has been little examined, and is no doubt a mixture of several substances, perhaps the result of some changes which have taken place. It is supposed to possess some of the narcotic properties of Opium. *Resin of Opium* contains Nitrogen, is brown, insipid and without odour, softens by heat, is soluble in alcohol, and in alkaline solutions, and remarkable for its electro-negative properties. *Oily* or *Fatty Matter* of Opium is probably colourless when pure, commonly yellow or brownish, acid, its alcoholic solution reddens litmus, it combines with alkalis, and forms soaps from which it may again be separated unchanged by the action of acids. The nature of the *Odorous Principle* of Opium is unknown, as it has never been isolated. It may be a volatile oil, as it rises with water when this is distilled off

Opium. (Soubeiran, Traité de Pharm. i. p. 364, and Turner's Chem. p. 1159.)

Adulterations. Opium is of different degrees of value, according to its sensible properties, and the quantity of Morphia it contains; but it is subject to adulterations. First it may be mixed up with too much water, either intentionally, or in consequence of the dew having been very heavy. The quantity may be ascertained by the loss on evaporation. The most injurious fraud is that of washing out the soluble and most valuable parts of Opium, and bringing the residual mass for sale. In this case Butter states that Opium loses its translucency and redness of colour, also its adhesiveness. Sand, clayey mud, sugar, molasses, cowdung, Salep, Datura-leaves, the glutinous juice of Ægle Marmelos, and even pounded poppy-seeds, are employed to adulterate Opium. Malwa Opium often contains oil and other matters obtained by the expression of the poppy-heads. Some Opiums from which Morphia has been extracted have been occasionally met with in European commerce. To be enabled to judge of good Opium, one must be well acquainted with the different varieties of Opium, their respective colours, tastes, and textures, as well as the natural degree of moisture, and see that no mechanical admixtures are apparent, nor left on a filter. Several methods have been proposed for ascertaining the quantity of Morphia in Opium, but none of them are very satisfactory. In the E. P. it is proposed to ascertain it by the weight of the precipitate caused in an infusion of Opium by Carbonate of Soda. "A solution of 100 grs. macerated 24 hours in Aq. f℥ij. filtered, and strongly squeezed in a cloth, if precipitated by a cold solution of Carbonate of Soda ℥ß. in two waters, and heated till the precipitate shrinks and fuses, will yield a solid mass on cooling, which weighs, when dry, at least 11 grains, and, if pulverized, dissolves entirely in solution of Oxalic acid." Dr. Pereira has not found this satisfactory, but considers as the best the process of Thibaumary, in which Ammonia is employed to precipitate the Morphia in infusion of Opium. (v. Mat. Med. p. 1742.) Dr. Christison considers Dr. Gregory's method of obtaining Muriate of Morphia as the only certain one; but it requires about a pound of Opium to be operated on, which, if good, should not yield less than ten per cent. of a snow-white salt.*

Tests. In cases of poisoning, the sensible appearances must necessarily differ according as a solid or a liquid preparation of Opium, or one of Morphia, has been employed. If either of the former, then the brownish colour, bitter taste, and peculiar odour, will indicate the pre-

* For analytical purposes, M. Guilliermond states that Morphia may be extracted from Opium in the following way. 15 parts of Opium are exhausted by careful trituration with 100 parts of rectified spirit. To the filtered tincture Ammonia is added in excess. When the solution has stood for 12 hours, crystals of Morphia and Narcotine separate from it. These are washed to free them from Meconate of Ammonia. The Narcotine is then dissolved out by Ether, and the Morphia dried and weighed.

sence of Opium. But in many cases the poison has entirely disappeared from the stomach, and the odour is alone recognizable,—especially on the first opening of the stomach. This odour is more perceptible, in any fluid containing it, on increasing the temperature (short of the boiling point, when some decomposition takes place). The other tests are of a chemical nature, and have been already enumerated, in describing the crystallizable ingredients of Opium; such as Nitric acid and Tinct. of Sesquichloride of Iron, both of which produce a red colour in a solution of Opium, the first from acting on its Morphia, and the second on the Meconic acid. In the case of organic mixtures, it is necessary first to make an aqueous extract of the contents of the stomach, &c., and then from that an alcoholic one. Dr. Christison has said that the evidence of Opium being present is irrefragable if the alcoholic extract present the peculiar bitterness of Opium,—if its watery solution, when acted on by Ammonia cautiously added, so as to avoid excess, yield a precipitate (Morphia) which becomes yellow with Nitric acid,—and if after the separation of this precipitate, the remaining fluid (then containing Meconate of Ammonia) gives, with Acetate of Lead, a precipitate (Meconate of Lead), which, when decomposed in water by Sulphuretted Hydrogen (Sulphuret of Lead being formed, Meconic acid dissolved) imparts to the water the property of becoming deep cherry-red with Sesquichloride of Iron. Mr. Taylor finds that N′ detects gr. $\frac{1}{15}$ of Mur. Morphia diluted in 300 parts of water; Sesquichlor. Iron gr. $\frac{1}{11}$ in 231 parts of water; and Iodic′ gr. $\frac{1}{100}$ in 1300 parts of water; but this last is open to fallacy with organic fluids. The *Iron test* for *Meconic′* is more delicate than the tests for Morphia.

Action. Uses. Opium, applied *externally*, is at first stimulant,—producing pain, as on the eye,—and then sedative. When taken *internally*, in small doses, excitement is first produced, as apparent in the increased frequency of the pulse, and heat of the skin. This is soon followed by diminished sensibility, calmness, and sleep, with abatement of pain, and by a suspension of mucous secretions, with the exception of that of the skin. But if the tendency to sleep be resisted, Opium, in moderate doses (and in those habituated to its use, in excessive doses), will produce intellectual excitement accompanied by bodily activity,—soon to be followed by general debility, as is exemplified in Opium-eaters. In large doses, it is a narcotic poison. It is frequently employed as an anodyne and hypnotic, as a sedative, to restrain inordinate discharges, as in diarrhœa and cholera, as a diaphoretic, as an antispasmodic, and even as a febrifuge. In Delirium Tremens it is beneficially given in large doses; and, combined with Calomel and sometimes with Ipecacuanha, may be used even in inflammatory affections, though in general it is contraindicated when there is inflammation or much fever. It is no doubt the most important of all therapeutical agents, and that perhaps which is the most frequently employed.

D. Opium may be administered internally either in a solid or liquid form, or its effects obtained by using one of its salts; or it may be applied externally, or introduced endermically. The medium dose is one grain, but it is subject to great variation, being often sufficient in much smaller doses, and at other times requiring to be increased to an extraordinary extent. It may often be advantageously introduced into the rectum, either as a suppository, or in the form of an Enema. Externally it may be applied endermically, or by friction in a liniment, or added to lotions, collyria, cataplasms, or plasters, by means of some of the following preparations.

Preparations of Opium.

Extractum Opii. L. E. Extractum Opii Aquosum. D. Cold watery Extract of Opium.

Prep. L. Take *powdered Opium* ℔iß. *Dist. Water* Ov. Add gradually to the Opium Oiiß. of Water, and macerate for 24 hours, stirring frequently with a spatula. Strain. Macerate what remains in the rest of the water for the same time; and strain. Lastly evaporate the strained liquor to a fit consistence. E. D. Similar.

This extract is of a brownish colour, of a bitter taste, and without odour. The parts soluble in water (*v.* p. 306), with a little of the resin, are taken up, and the insoluble, with some active principles, however, left behind. This extract is considered to be less exciting than pure Opium, and is therefore occasionally preferred in some of the cases for which opium or the salts of Morphia are indicated. But as it is uncertain, the Morphia salts seem preferable in cases where constitutional disturbance is to be avoided, and crude Opium or Laudanum can alone be relied upon in urgent cases.

D. gr. ½ to gr. iij. or gr. v.

Pilulæ Opii sive Thebaicæ, E. Opium or Thebaic Pills.

Prep. Beat into a proper mass *Opium* 1 part, *Sulphate Potash* 3 parts, *Conserve of Red Roses* 1 part. Divide into 5 gr. pills.

Each contains of Opium gr. j., that is, twice as much Opium as the Opiate pill of the last Latin ed. of the E. P. 1 to 2 pills for a dose.

Pilula Saponis composita, L. D. (*v.* Sapo.)
Opium gr. j. in 5 grains of the Pill. gr. v.—gr. x. for a dose.

Pilula Styracis composita, L. Pilulæ Styracis, E. (*v.* Styrax.)
Opium gr. j. in 5 grains of the Pill. gr. v.—gr. x. for a dose.

Pilulæ Calomelanos et Opii, E. (*v.* p. 209.)
Each Pill contains Calomel gr. ij. and Opium gr. ½.

Pilulæ Plumbi Opiatæ, E. (*v.* p. 182.)
Each Pill contains of Meconate of Lead gr. iij. and of Acetate of Morphia gr. ½ nearly.

PILULA IPECACUANHÆ CUM SCILLA, L. Pil. Ipecac. et Opii, E. (*v.* Ipecacuanha.)

gr. $\frac{3}{10}$ of Opium in 5 grains of the Pill.

TROCHISCI OPII, E. Opium Lozenges.

Prep. Reduce *Opium* ʒij. to a fluid extract, as directed in Extractum Opii, E. mix it intimately with *Extract of Liquorice,* ℥v. reduced to the consistence of treacle, add *Tincture of Tolu* ℥ß. sprinkle into the mixture *powdered Gum Arabic* ℥v. and *finely powdered pure Sugar* ℥vj. Beat into a proper mass. Divide into lozenges of 10 grs.

Each lozenge contains about $\frac{1}{10}$ of a grain of the Extract; those of the shops usually contain about $\frac{1}{6}$ of a grain of Opium. Both are useful, like the Morphia lozenges, in allaying troublesome cough.

PULVIS CRETÆ COMPOSITUS CUM OPIO, L. Pulvis Cretæ Opiatus, E. D. Compound Powder of Chalk with Opium.

Prep. L. Triturate thoroughly together *Comp. Chalk powder* ℥viß. and *powdered Opium* ℈iv. E. D. Similar.

Two scruples of the L. and D. and 37 grs. of the E. prep. contain of Opium gr. j. with Chalk, Tormentil, Cinnamon, and Long-pepper.

Action. Uses. Antacid, Astringent, Stimulating, and Narcotic. Useful in some Diarrhœas in doses of gr. x.—gr. xxx.

PULVIS IPECACUANHÆ COMPOSITUS, L. E. D. (*v.* Ipecacuanha.) Contains of Opium gr. j. in 10 grains of the powder.

PULVIS KINO COMPOSITUS, L. (*v.* Kino.) Contains of Opium gr. j. in 20 grains of the powder.

CONFECTIO OPII, L. Electuarium Opii, E. Confection of Opium.

Prep. L. Dry, and reduce together to a fine powder *Long Pepper* ℥j. *Ginger* ℥ij. *Carraway* ℥iij. *Tragacanth* ʒij. and *powdered Opium* ʒvj. Preserve them in a close vessel, and when required, add the powder by degrees to warmed *Syrup* f℥xvj. and mix.

E. Mix and beat into an electuary *Aromatic Powder* ℥vj. finely powdered *Senega* ℥iij. *Opium* diffused in a little *Sherry* ℥ß. *Syrup of Ginger* ℔j.

These preparations, intended as substitutes for the old Theriaca, differ a little in strength: that of the L. P. contains about Opium gr. j. in 36 grs., that of the E. P. 1 in 43 grs. of the Confection. All are stimulant and anodyne, hence often appropriate in the treatment of Chronic Diarrhœas, &c. in doses of gr. x.—ʒj.

ELECTUARIUM CATECHU, E. Confect. Catechu Comp., D. (*v.* Catechu.)

Astringents and Aromatics with Opium gr. j. in about 200 grs. of the Electuary.

TINCTURA OPII, L. E. D. Tincture of Opium. Laudanum.

Prep. L. Macerate *powdered Opium* ℥iij. in *Proof Spirit* Oij. for 7 days; then express and strain. E. ℥iij. of *sliced Opium* are macerated for 2 hours in f℥xiiiß. of *Water* kept near 212°. The solution is strained and expressed. The residue is digested in Oj. and f℥vij. of *Rect. Spirit* for 20 hours, then strained and expressed strongly. The watery and spirituous liquors are mixed. D. Similar to L.; 14 days are allowed. All three preparations are of the same strength.

Laudanum is of a deep brownish-red colour, with the peculiar taste and odour of Opium. Dr. Christison says that by the E. process, that is, macerating the Opium first in hot water, then in rectified spirit, in may be made in 36 hours. Sp. Gr. 0·952. About 1 gr. of Opium is employed to make 13 minims of tincture. But 19 minims of the tincture are required to yield on evaporation 1 gr. of solid residue. Dr. Christison states that f℥j. of good tincture should yield from 17 to 22 grains of perfectly dry matter; also that the L. tincture is sometimes stronger than the others. Some Morphia is contained in the residuum, and has been separated by Dr. Pereira. Mr. Haden used to make a substitute for Liq. Opii Sedativus by macerating the lees with Tar′. M. Martin, by fermenting the lees with sugar, obtained an extract possessed of narcotic properties.

Action. Uses. Laudanum is a powerful anodyne and narcotic, and the form in which the effects of Opium may most effectively be obtained either externally or internally.

D. ♏x.—f℈ß; but much larger doses may be exhibited in particular cases. Great caution is required in prescribing it to children. Infants have been killed by 4 drops, and unpleasantly deep sleep has been produced even by 2 drops. (*c.*)

VINUM OPII, L. E. D. *Laudanum Liquidum Sydenhami*, Ph. L. 1720. *Tinctura Thebaica*, Ph. L. 1745. Wine of Opium.

Prep. L. Macerate *Extract of Opium* ℥iiß. *Cinnamon* bruised, and *Cloves* bruised of each ʒijß. in *Sherry Wine* Oij. for 7 days. Filter. E. D. Crude Opium is used; and the product somewhat weaker.

Wine of Opium, Sydenham's Liquid Laudanum, differs from the former not only in the menstruum, but in being made from the purified Opium, and in the presence of the aromatics. Hence it is more agreeable both in taste and smell, and may be used in many cases for the same purposes. Dr. Paris has proposed adding the Opium to wine during its state of fermentation.

D. ♏x.—f℈j. Often dropped into the eye in Ophthalmia.

TINCTURA OPII AMMONIATA, E. Ammoniated Tincture of Opium. *Scotch Paregoric.*

Prep. Digest for 7 days *Opium* sliced ʒß. *Benzoic acid* and *Saffron* chopped of each ʒvj. *Anise Oil* ʒj. *Spirit of Ammonia* Oij. Filter.

The Spirit of Ammonia, E. being made with caustic Ammonia, and

being in excess, first precipitates and then dissolves the Morphia. This preparation is three times stronger than English paregoric, the activity of 1 grain of Opium being possessed by 80 minims.

TINCTURA CAMPHORÆ COMPOSITA, L. Compound Tincture of Camphor. Tinct. Opii Camphorata, E. D. Camphorated Tincture of Opium. Paregoric Elixir. English Paregoric.

Prep. L. Macerate together *Camphor* ℈iiß. *Opium* in powder gr. lxxij. *Benzoic'* gr. lxxij. *Oil of Anise* f℥j. *Proof Spirit* Oij. for 7 days; and strain. E. D. Similar; strength greater by about 1-10th.

Though this preparation is named from Camphor, Opium is its most powerful ingredient; hence it is described in this place. The L. name is advantageous, as enabling Opium to be prescribed without the knowledge of the patient. The presence of the stimulants is supposed to counteract the debilitating effects of Opium on the stomach, while the Benzoic acid, determining to the mucous surface of the aerial passages, diminishes profuse secretion, and the Opium quiets troublesome cough by allaying sensibility. Hence it is much employed to relieve the tickling of coughs, and likewise in some diarrhœas. Each f℥ß. or 240 minims contains of Opium gr. j. nearly.

D. f℈ß.—f℈iv. Frequently added to cough mixtures.

ACETUM OPII, E. D. Vinegar of Opium.

Prep. E. Take *Opium* ℥iv. *Distilled Vinegar* f℥xvj. Cut the Opium into small fragments. Triturate into a pulp with a little of the Vinegar, then add the rest, and macerate for 7 days in a close vessel, agitating occasionally. Express strongly, and filter. D. Similar; but less than 1-3rd of the strength.

Vinegar is one of the best solvents of the active properties of Opium. Probably an Acetate of Morphia is formed at the expense of the Meconate, and it is preferred, as capable of producing the anodyne and soporific with less of the disagreeable effects of Opium. The D. preparation may be given in doses of ♏x.—♏xxx., being about as strong as laudanum; but the E. prep. is much stronger, its dose being ♏v —x.

The Black Drop is a celebrated nostrum, in which Opium is boiled with aromatics in verjuice (from the wild crab), sugar is added, and the whole fermented. One drop is considered equal to two or three drops of Laudanum. The above or the salts of Morphia are the best substitutes.

Liquor Opii Sedativus, of Mr. Battley, is another secret preparation, which has long been esteemed in the Profession for its efficacy and its little disagreeable effects as an opiate. It is supposed to be an aqueous solution of Opium. Mr. Cooley states that it contains a Meconate of Morphia combined with extractive and such other matter as is soluble

in temperate distilled water, and that we may produce it by the following formula:

Take *dry Opium* (Smyrna) *in powder*, 1 part, *clean washed* (silica) *sand*, 2 parts. Mix, and moisten with water, introduce into a percolator, and pass *Aq. dest. at* 65° *or* 70° F. through the ingredients, until it passes both tasteless and colourless. Evaporate the liquor (by steam or water-bath) to the consistence of a *hard pill extract.* Take of this *hard extract* ℥iij. and *Aq. Dest.* f℥xxx. Boil for two minutes; let it cool; filter; then add *Rectified Spirit* f℥vj. and *Aq. Dest.* q. s. to make up nearly f℥xl. or one quart.

D. ♏v.—♏xx. ♏xx. are equal to about ♏xxx. of Laudanum.

Enema Opii, L. E. (vel Anodynum, E.) Opium Clyster.

Prep. L. Take *Tincture of Opium* ♏xxx. and *Decoction of Starch* f℥iv. Mix. E. Similar.

Action. Uses. Laudanum in this form often relieves many painful affections of the intestinal canal and urinary organs.

Linimentum Opii, L. E. D. Liniment of Opium.

Prep. L. Mix *Soap Liniment* f℥vj. and *Tinct. of Opium* f℥ij, E. Macerate *Castile Soap* ℥vj. and *Opium* ℥iß in *Rectified Spirit* Oij. for 3 days; filter, add *Oil of Rosemary* f℥vj. and *Camphor* ℥iij. Agitate. D. Mix with agitation *Tincture of Opium* and *Soap Liniment* āā f℥j.

Action. Uses. The external friction of Laudanum not only relieves local pain, but produces the general soporific effects of Opium.

Emplastrum Opii, L. E. D. Plaster of Opium.

Prep. L. Add *Lead Plaster* ℥viij. to *prepared Frankincense* ℥ij. melted over a slow fire; then add *Extract of Opium* ℥j. previously mixed with *Boiling Water* f℥j. and stir constantly. Evaporate to the proper consistence over a slow fire. E. One-third of the strength of L. D. About as strong as L. prep.

Action. Uses. Applied to relieve Rheumatic and other pains.

Unguentum Opii, L. Ointment of Opium.

Prep. Rub *Powdered Opium* ℈j. with *Lard* ℥j.

This ointment forms a valuable local anodyne for general use. It was introduced in the last Pharmacopœia.

Unguentum Gallæ compositum, L. is an astringent application which contains Opium ʒß. in about ℥ij. of the ointment.

Ung. Gallæ et Opii, E. is similar.

Inc. Several minerals decompose Opium, and cannot therefore be prescribed with it,—as alkalis in small quantity; but these, when in excess, redissolve the Morphia they have precipitated. Alkaline Carbonates, Lime-water, Astringents containing Tannic acid, Sulphates

of Zinc, Copper, Iron, and Lead, Nitrate of Silver, Bichloride of Mercury.

Antidotes. In cases of poisoning by Opium or Laudanum, evacuate the stomach either by means of the stomach-pump, by tickling the throat, or by prescribing such emetics as are at hand, as salt or mustard. The Sulphate of Zinc in large doses is the best emetic. Sometimes Tartar Emetic with Ipecacuanha is resorted to; or, in extreme cases, a solution of 1 gr. of Tartar Emetic may be injected into the veins, taking care that no air enters at the same time. During the whole of this time, the patient should be roused by loud talking, shaking, and making him walk about. Apply the vapours of Ammonia or of Acetic acid to the nostrils. Cold affusions to the head and chest are of great efficacy. Distending the stomach with astringent infusions, as of Cinchona or of Gallnuts, will assist in decomposing the Opium. When the stomach has been freed of the poison, vegetable acids and venesection are useful; while such stimulants as Carbonate of Ammonia and Brandy and Coffee will be useful in rousing and supporting the patient. Sinapisms and irritants to the feet, &c., ought to be applied; and artificial respiration not neglected.

CRUCIFERÆ, *Juss.* Cressworts.

Cruciferæ are allied to Papaveraceæ and to Capparideæ, and are found chiefly in the temperate parts of the Northern hemisphere, but a few species occur in most parts of the world. They abound in mucilaginous, and the roots of some in saccharine principles. A fatty oil is stored up in the seeds of many, Sulphur is contained in some, and nearly all abound in an acrid principle, which makes them useful as Condiments, Rubefacients, and Stimulants.

Cochlearia officinalis, or Scurvy-grass, which was long esteemed as an antiscorbutic, and Cardamine pratensis, or Cuckoo-flower, the flowers of which were supposed to be stimulant, are both natives of England, but are now no longer officinal.

ARMORACIA, L. E. Radix recens. Cochlearia Armoracia, *Linn.* Horse-radish. Fr. Cran de Bretagne.

This plant is supposed by some to be the *wild radish* of Dioscorides and the *Armoracia* of Pliny. It seems to have been first clearly recognized by Brunsfels in 1530. It is a native of most hilly situations in Europe, and is much cultivated in this country, flowering in May.

Bot. Ch. Root perennial, long, white, and tapering, pungently acrid, throwing up large pedunculate leaves, which are lanceolate crenate, smooth, deep green, much veined, and somewhat resembling those of the Water Dock. From the midst of these rise erect stems, 2 or 3 feet high, furrowed and branched towards the top. Stem-leaves small, sessile, the lower ones with the margin much cut, the upper lanceolate, toothed. Inflorescence a raceme. Calyx spreading, equal at base. Petals white, obovate, entire. Filaments not toothed, straight above

Silicle ovate, valves very convex. Dissepiment thin, but broad. Seeds numerous. Cotyledons accumbent. The silicles differ from those of Scurvy-grass, in wanting the dorsal nerve, they are inflated, almost globose, but often abortive. By Wettereau and others it has been separated from *Cochlearia* (on account of the valves of the silique being without a dorsal nerve), and formed into a new genus Armoracia, with the specific name of *A. rusticana.*

Fig. 42.*

The fresh root, which is alone officinal, is thick and long, fleshy and white, emitting when scraped a pungent diffusible odour, and imparting a hot and acrid taste, with some sweetness. Its virtues depend upon a volatile oil, which is dissipated by drying, and also by heat. Hence the root is usually used as a condiment in its fresh state. A little of the activity is communicated to water, but most completely to alcohol. Dr. Duncan states that the oil is in the proportion of four parts in a thousand, Gutret has found much less. The oil is of a light yellow colour, heavier than water, very volatile. It tastes at first

* 1. Leaf. 2. Raceme. 3. Flower, with the Calyx and Corolla removed. 4. Pistil. 5. Silicule.—E. B. t. 2223.

sweetish, soon becomes acrid and burning, inflaming the lips and tongue. It will produce vesication when applied to the skin. The watery solution precipitates Acetate of Lead brown, and Nitrate of Silver black, that is, forms Sulphurets of these metals, showing that the oil contains Sulphur. The other constituents of the root are Bitter Resin, Extractive, Sugar, Gum, Starch, Albumen, Lignin, and Salts.

Action. Uses. Externally. Rubefacient, Vesicant, Irritant. *Internally.* Stimulant, Masticatory, Diuretic.

INFUSUM ARMORACIÆ COMPOSITUM, L.

Prep. Macerate *Horse-radish* sliced, and *Mustard* bruised, of each ℥j. in *Boiling Aq.* Oj. for 2 hours in a covered vessel; strain, and add *Compound Spirit of Horse-radish* f℥j.

Action. Uses. Stimulant and Diuretic.
D. f℥i. to f℥ij.

SPIRITUS ARMORACIÆ COMPOSITUS, L.

Prep. Mix together *Horse-radish* sliced, *Dried Orange-peel,* āā ℥xx. *Nutmegs* bruised ℥v. *Proof Spirit* Cj. *Aqua* Oij. and let a gallon of fluid distil over with a slow fire.

Action. Uses. Stimulant adjunct, especially to Diuretic infusions.
D. f3j.—f3iv.

SINAPIS, L. E. D. Semen. (Flour of the Seeds, E. D.) Sinapis nigra and S. alba, *Linn.* Black and White Mustard. *Tetradynamia Siliquosa,* Linn.

Common Mustard consists of the flour of the seeds of the Black Mustard, generally mixed with that procured from the seeds of the White Mustard, or Sinapis alba, and deprived of fixed oil by expression. Both species have been long used in medicine, being the *ναπυ* of Hippocrates, and the Sinapi of the Romans. The Black Mustard is indigenous in almost every part of Europe. So also is the White Mustard, which, possessing nearly the same properties, may also have been employed by the Greeks.

Bot. Ch. S. NIGRA. The root is thick and fleshy, the stem about 2 to 3 or 4 feet high, hispid below, with smooth round branches above. Lower leaves large, rough, lyrate, variously lobed and toothed; upper ones narrow, lanceolate, smooth, dependent. Calyx yellowish, equal at base, spreading. Petals obovate, yellow, spreading. Silique small, erect, or placed close to the stem, obtusely quadrangular, nearly even and smooth, tipped by a short quadrangular style, but without the proper, often seed-bearing beak of the genus; the valves convex, with one straight dorsal nerve, and a few lateral anastomosing veins. Seeds numerous, in a single row, small, round, blackish brown. Fig. 43.—E. B. t. 969.

S. ALBA. Root tapering, small. The stem 1—2 feet or more high, round, smooth, or slightly hairy. Leaves lyrate, irregularly lobed or pinnatifid, roughish. Sepals linear, green, horizontal. Flowers large, yellow. Silique hispid, spreading on nearly horizontal stalks, short, tumid or knotty from the prominent seeds,

shorter than the sword-shaped beak; valves with 5 straight strong nerves Seeds few on each side, large and roundish, pale yellow coloured, having in the interior a yellow mass, which is covered by a thin pellicle of what must be composed of condensed mucilage. Fig. 44.—E. B. t. 1677.

The Black Mustard only was mentioned in the P. L. of 1836. The seeds of *Sinapis arvensis*, Charlock, or Wild Mustard, are sometimes found among Mustard-seeds. The pods of this plant, like those of *S. alba*, have a long sword-shaped beak; and each of the valves is three-nerved, those of *S. alba* being five-nerved. Black Mustard, having neither the beak nor the nerves, has been removed to the genus Brassica by Koch and other botanists.

Fig. 44.

Fig. 43.

The Mustard plants are officinal on account of their seeds, or rather of the flour of these seeds, so well known as a condiment by the name of Mustard. Dr. Pereira states that the best flour of Mustard is prepared by crushing the seeds of both Black and White Mustard between rollers, and then pounding them in mortars, when they are

twice sifted to yield *pure flour of Mustard.* Dr. Christison's information confirms that of Dr. Pereira, that common flour of Mustard is adulterated, partly on account of the pungency of Black Mustard seed. "Two bushels of black, and three of white seed yield, when ground, 145 pounds of flour; which, to diminish the pungency and improve the colour, is mixed with 56 pounds of wheat flour and two pounds of turmeric; and the acrimony is restored without the pungency, by the addition of a pound of (capsicum) chilly pods, and half a pound of ginger." (*c.*) The *pure flour* of Mustard ought alone to be used officinally.

Though Black and White Mustard have both been minutely examined by several chemists, they still require further investigation. The former contains a fixed Oil, Gummy matter, Sugar, a Colouring and a Peculiar green matter, a Fatty pearly matter; *Myronic acid* in combination with *Potash*, or Myronate of Potash, *Myrosyne*, *Sinapisin*, and some salts. The fixed oil of Mustard forms 28 per cent. It is mild in taste, with little odour, of a yellow colour, Sp. Gr. 0·917, thicker than olive oil, does not readily become rancid, makes an excellent soap, is sometimes used instead of rape oil, and has been employed as a purgative. (*Bussy.*) * *Sinapisin* of Simon is in white, brilliant, micaceous, and volatile crystals, soluble in alcohol, ether, and oils, insoluble in acids and alkalis. *Myrosyne* is a substance analogous to vegetable albumen or the emulsin of bitter almonds. *Myronic acid*, composed of Carbon, Hydrogen, Oxygen, Nitrogen, and Sulphur, is bitter, without odour, uncrystallizable, and may be separated in an impure state by alcohol, when the fixed oil has already been removed by expression or by ether.

It is curious that we do not find among the above products, the acrid principle for which Mustard is so remarkable. In fact, it is not contained in the seeds; the acrimony is due to what is called *Volatile Oil of Mustard*, which is the result of the action of some of the constituents of the seed on one another, when water is added under 200° F. Bussy is of opinion that the Myronic acid, on the contact of Myrosyne and water, yields the volatile oil of Mustard. When flour of Mustard is exposed to dry heat, or acted upon by alcohol, no acridity is observed; but if water be added first, the pure volatile oil is obtained, which may be separated by distillation. The mineral acids check the formation of this volatile oil, so does the Carbonate of Potash, and also the vegetable acids when they are of the Sp. Gr. of at least 1022; though when once formed, the acids have no influence in preventing its effects.

The Volatile Oil of Mustard is white or of a lemon colour, extremely acrid and pungent, and exciting the secretion of tears. Sp. Gr. at 68° F.

* In this oil, as well as in the fixed oil obtained from White Mustard-seed. M. St. Darby has discovered a new fatty acid, which he has named Erucic acid, It melts at 93° Fahr., and has the formula $C_{44} H_{42} O_4$. (P. J. ix. 83).

1·015, boiling at 290° F. Soluble in alcohol and ether; slightly in water, and separated from it with difficulty, in consequence of having nearly the same Sp. Gr. With Ammonia it forms a compound in which the oil of Mustard. is destroyed. Sesquichloride of Iron produces an orange tint in infusion of Black Mustard seed. The oil consists of C 49·84, H 5·09, N 14·41, O 20·48, Sulphur 10·18. (Dumas and Pelouze.)

White Mustard seeds yield about 36 per cent. of fixed oil, and when macerated in water, yield a thick, mucilaginous, almost insipid liquor, while Black Mustard seeds give little mucilage, but a pungent taste to the water. According to the analysis of John, these seeds contain — 1. An acrid volatile oil. 2. A yellow fixed oil. 3. Brown resin. 4. A very little extractive. 5. A little gum. 6. Lignin. 7. Albumen. 8. Phosphoric acid, and salts. Henry and Garot ascertained the presence of *Sulphosinapisin,*— a name which Berzelius has contracted into Sinapin. This is white and light, without odour, at first bitter in taste, but then like mustard; soluble in water, alcohol, and ether, and crystallizable. It consists of C 57·92, H 7·79, N 4·9 O 19·68, and of Sulphur 9·65. "Acted on by acids, oxides, and salts, readily yields Sulphocyanic acid" (*p.*), which strikes a red colour with the persalts, as for instance the Sesquichlor. Iron, and produces a white precipitate in a solution of Sulphate of Copper containing Iron. White Mustard does not furnish volatile oil; but, in certain circumstances similar to those with Black Mustard seed, a fixed acrid principle is produced, which, like the volatile oil of Black Mustard, did not previously exist.

The *fixed acrid principle* is an unctuous liquid of a reddish colour, without odour, but having a biting acrid taste, analogous to that of Horseradish root. It contains Sulphur. M. Faure states that this same principle is formed in small quantity when Black Mustard is treated with water. *Erucin*, which does not redden the salts of Iron, and contains no Sulphur, is another principle found by Simon.

Tests. As the common flour of Mustard is that usually employed, we generally make use of adulterations along with the true flour. But as Mustard flour is sometimes exhibited internally, it is desirable to have it in a pure form. The adulteration of wheat flour can be easily detected, by the test of the E. P. "A decoction allowed to cool is not turned blue by tincture of Iodine."

Action. Uses. Powerfully acrid and pungent. The seeds of the White Mustard, taken in an entire state, have their mucilaginous covering dissolved away by the juices of the stomach, and will then act as stimulants. Two or three tea-spoonfuls used to be given two or three times a day in dyspepsia. The uses of Mustard as a condiment, and of the young herb as a salad, are well-known. It is Stimulant; Diuretic, in the form of Mustard Whey. Externally Rubefacient, &c. Much used in the form of the Mustard Poultice. (q. v.) Emetic in doses of a tea-spoonful to a table-spoonful in half a pint of water.

CATAPLASMA SINAPIS, L. Mustard Poultice or Sinapism.

Prep. Take of powdered *Mustard* and *Linseed Meal* āā ℥iiß, or q. s. Mix the powders; then add them by degrees to *Boiling water* f℥x, stirring, so that a poultice may be made.

Pure Mustard should be used; as common Mustard flour is weakened by the addition of wheat flour. It may also be made with bread-crumb, or the Mustard flour may be spread on a poultice. Vinegar used to be ordered; but, except where the Mustard is adulterated with Capsicum, it is worse than useless, as it prevents the formation of the acrid volatile oil. Messrs. Trousseau and Pidoux found boiling water unnecessary, as a cold poultice produces the same effect as a hot one, but takes a little longer time to produce its effect. The volatile oil is a powerful rubefacient and vesicatory, in the proportion of 1 part to 20 of proof spirit.

VIOLACEÆ, *Juss.*

The herbaceous species inhabit the temperate parts of the Northern, a few the Southern hemisphere, and within the tropics. The shrubby species grow in South America and India. The stems and leaves are mucilaginous, and contain Violine, which is similar in its nature and effects to Emetine. This has also been found in some of the shrubby species of Ionidium. Several of them (see Martius's Spec. Mat. Med. Braziliensis) are employed as substitutes for Ipecacuanha. The roots of Ionidium Ipecacuanha are the *false Ipecacuanha of Brazil*, and yielded Pelletier 5 per cent. of Emetine. Cuchunchully de Cuença, the roots of *Ionidium microphyllum*, are similar in properties. There are specimens in the Museum of K. C. from the Hon. Fox Strangways.

VIOLA ODORATA, *Linn.* L. E. Petalum recens, L. Flowers, E. The March or Sweet Violet. *Pentand. Monog.* Linn.

This, the ἴον of the Greeks, is found wild on the borders of fields, in shady situations in many parts of Europe, but is cultivated on account of its flowers, which are so much esteemed for their agreeable odour and colour.

Bot. Ch. The plants are stemless, but give out runners. The leaves are broadly cordate, pubescent. Sepals obtuse, the lowest petal emarginate, the four upper ones roundish-obtuse, a little narrower. Stigma hooked, naked. The fruit bearing peduncles, prostrate, straight at the apex.

The flowers should be gathered soon after they have blown. The colour may be retained for some time if they are carefully dried, but for a still longer period if preserved in syrup. As the violet or purple colour is changed into red by acids, and green by alkalis, it is often employed as a test.

Action. Uses. The expressed juice and the syrup are slightly laxative; and hence, besides being employed on account of its odour and colour, the Syrup is prescribed as a laxative for young, especially newborn children, with an equal quantity of almond oil, in doses of one or two tea-spoonfuls.

Violets, and other species, as V. tricolor, have also been employed as demulcent expectorants on the Continent. The seeds are stated to be purgative and emetic by Bichat, &c., as are also the roots.

SYRUPUS VIOLÆ, L. E. Syrup of Violets.

Prep. L. Macerate *fresh violet petals* ℥ix. in *boiling dist. water* Oj. for 12 hours; then press and strain; set aside, that the dregs may subside; add *Sugar* ℔iij. or q. s., dissolving with a gentle heat; and, when cool, add to each f℥j. *Rectified Spirit* f℥ß. E. similar; no spirit.

POLYGALEÆ, *Juss.*

The Polygaleæ are found in the temperate and warm regions of the whole world. Many of the species abound in bitter principle, as *P. vulgaris* and *P. amara;* others secrete a peculiar principle, which has been called Polygaline. Several species are officinal in Brazil and India.

SENEGA, L. E. D. Polygala Senega, *Linn.* Radix. Seneka Snake Root.

This root was introduced into practice in 1735, by Dr. Tennant, of Virginia, who learnt from the Senagaroo Indians that they employed it as an antidote against the bite of the rattle-snake. It is a native of the United States of America, chiefly in the southern and western sections, where the roots are collected in large quantities.

The plant (Fig. 45) is small, with a perennial branched root, from which arise several erect annual stems, smooth, simple, round and leafy, which are occasionally tinged with red in their lower portion. The leaves are sessile, alternate, oblong, lanceolate, of a bright green on the upper surface. The flowers are small, arranged in terminal spikes. Sepals 5, two of which are large, wing-like, and white. Petals 3, small, closed, with a beardless keel. Capsule elliptical, emarginate, covered by the persistent sepals.—Barton Am. Med. Bot. 11. t. 36. Fig. 45. 1. Sepals spread out with the petals adpressed against each other. 2. Central Petal or Keel with the Stamens adhering. 3. A Seed.

Seneka roots are brought to market in bales of from 50 to 400 pounds: the pieces vary in thickness from a small quill to that of the little finger; head knotty, exhibiting marks of former stems, branched, twisted, with a projecting keel-like line along its whole length; bark-like part is corrugated, cracked, of a yellowish-brown colour in the young roots, and brownish-grey in the old, resinous, and contains the active principle; the central portion, or meditullium, is woody, white, and quite inert. (Goebel and K. ii. t. xx. f. 1.) The odour is peculiar, strong in the fresh root (Wood and B.); taste at first mild, becomes bitter and acrid, exciting irritation in the fauces and a secretion of saliva. Seneka has been analysed by various chemists: the latest, Quevenne, finds Polygalic, Virgineic, Tannic, and Pectic acids, Wax, Fixed oil, yellow Colouring matter, Gum, Albumen, Woody

fibre, and various Salts. The *Polygalic acid*, Senegine of Gehlen, and Polygaline of others, is solid, brownish-coloured, white when pure, translucent, without odour, and at first insipid, but soon excites sneezing when powdered, and a disagreeable taste in the mouth with constriction in the fauces. It is insoluble in ether and oils, partially soluble in water, but readily in alcohol. Given in doses of 6 or 8 grains to dogs, it has been known to cause vomiting, difficulty of breathing, and death in three hours.

Fig. 45.

Action. Uses. Seneka, as indicated by its acrid taste, is possessed of Stimulant properties; it increases many of the secretions, acting as a Sialogogue, Expectorant, Diaphoretic, Diuretic, and Emmenagogue; and, in large doses, it is Emetic and Cathartic.

The roots of Panax quinquefolium, or Ginseng, are sometimes mixed with the Seneka.

D. Of the powder, gr. x.—gr. xx. But the decoction is the best form of exhibition.

Decoctum Senegæ, L. Decoction of Seneka Root.

Prep. Boil *Seneka-root* ℥x. in *Aq. dest.* Oij. down to a pint and strain. The E. C. orders an *Infusum Senegæ* to be made by infusing for 4 hours *Seneka* ℥x. in boiling *Aq.* Oj.

D. f℥j. to f℥iij. 3 or 4 times a day.

The U. S. P. has a Syrup of Seneka root, and it forms an ingredient in their Mel Scillæ compositum.

Krameriaceæ, *Lindl.*

Krameria, L. E. Rhatania, D. Radix. Krameria triandra, *Ruiz and Pavon.* The Rhatany Plant.

The Rhatany plant is a native of Peru, growing on the slopes of sandy mountains, especially near Huanuco, where it was discovered in 1779 by Ruiz, who found that the root was employed by the ladies for rubbing the teeth and strengthening the gums.

The shrub is small but much branched, with the younger parts covered with silky hairs. The stems procumbent, and the roots horizontal or creeping, as said to be indicated in the name Rhatania. These roots are long, much branched, with a dark reddish bark. The leaves are sessile, oblong-ovate, pointed, and silky. The flowers are solitary, in the axils of the upper leaves, with short stalks. The calyx consists of 4 spreading sepals, silky externally, but smooth, shining and lake-coloured in the inside, though this is not visible in dried specimens. Petals 5, unequal, the (two upper petals separate, spathulate; two lateral roundish, concave, *Lindl.*) three anterior clawed, with the claws united, limbs small, sometimes abortive, the two posterior sessile, thickish. Stamens 3, anthers opening by a double pore at the apex. The fruit is globular, leathery, indehiscent, about the size of a pea, covered with reddish-brown hooked prickles; one-celled, with one seed, the other being abortive. Seed inverse, suspended, without albumen.—Fl. Peruv. 1, t. 93.

Rhatany root is woody and branched; the pieces vary in diameter from an inch to that of a quill; the cortical part is reddish-brown, fibrous, and easily separated from the central, reddish-yellow, woody part. The root is without smell, but has an extremely astringent taste without any bitterness. The cortical portion contains a much larger portion of the active principle than the interior; the smaller pieces, from the greater proportion of bark, are the most efficacious. (G. and K. ii. tab. iv. fig. 2.) Besides the root, an extract is sometimes imported from S. America.

Rhatany Root consists of one-third of matters soluble in water. These consist of Tannin 42·6, Gallic acid 0·3, Gum, Extractive, and Colouring matter 56·6, and Krameric acid 0·5. The properties are no doubt in a great measure due to the Tannin, and, according to Peschier, to the Krameric acid also, which he describes as being very styptic, not crystallizable, but forming with the alkalis salts which do crystallize. M. Chevalier, on repeating the experiment, was unable to procure any of the acid. Water and Alcohol both take up the active properties, and become of a reddish colour.

Inc. The salts of Iron and other metals, Gelatine, mineral acids, Inf. Cinchonæ, Potassio-Tartrate of Antimony.

Action. Uses. Astringent, Tonic.

D. Powder, gr. x.—ʒß.

INFUSUM KRAMERIÆ, L. D.

Prep. L. Macerate *Krameria* ℥j. in boiling distilled *Aq.* Oj. for 4 hours in a covered vessel and strain. D. similar.

D. f℥iß.—f℥ij. twice or thrice a day. The decoction is also a good form for exhibition. Astringent taste, and of a reddish colour.

In the United States, a compound Tincture is prepared, with powdered root ℥iij. Orange-peel ℥ij. Serpentaria ℥ß. Saffron ʒj. in Proof Spirit Oj. It is a grateful astringent.

EXTRACTUM KRAMERIÆ, E.

Prepared as Extract of Liquorice, E.

D. gr. x.—℈j.

Has a reddish-brown colour, with a vitreous and shining fracture, and yields a blood-red powder, bearing a close resemblance to Kino. That imported from S. America used to be, and perhaps still is, employed for adulterating port wine.

LINEÆ, *Dec.* Flaxworts.

They are found in temperate parts of the world, with a few in tropical regions. The Lineæ are remarkable for the tenacity of the fibre of their inner bark, also for the mucilaginous covering of the seed, and for the oil contained in the seeds. Some are bitter. and a few purgative.

LINUM USITATISSIMUM, *Linn.* Semina, L. E. D. Oleum e seminibus expressum, L. E. D. Meal of the Seeds deprived of their fixed oil by expression, E. Flax; Linseed; Linseed oil; Linseed meal. *Pentandria Pentagynia*, Linn.

Flax was cultivated in Egypt at very early periods. It is so at the present day from the north of Europe to the south of India; and it is not, therefore, easy to ascertain where it is indigenous.

The Flax plant is an annual, with a slender root, smooth, simple, erect stem, about a foot and a half in height and branched towards the top. The leaves are alternate, sessile, linear, lanceolate, smooth. The flowers, of a blue colour, are arranged in a corymbose panicle. The sepals are ovate, acuminate, slightly ciliated, but without glands, nearly equal to the capsule in length. The petals are obscurely crenate, of a purplish blue, large, deciduous. Capsule roundish, about the size of a pea, containing 10 seeds *(linseed)* small, oval, flattened, smooth and shining, of a brown colour, but whitish in the inside; the seed-coat mucilaginous, the kernel oily and farinaceous.—E. B. 1357.

Flax, as it is well known, is prepared from the above plant, by steeping, stripping off the bark, and then beating, so as to separate

the fibres. Linen and cambric are prepared from it, the latter differing from the former in its fineness, and in being obtained from plants which are more thickly sown. Linen, as clothing, is cool, from being a better conductor of heat than cotton; but when the skin is covered with perspiration, or exposed to cold, it feels cold and chilly. The fibre of flax is a straight tube-like cylinder, and is therefore less irritating than the twisted fibre of cotton. Hence lint, which is prepared by scraping linen, is so much preferable to cotton for surgical dressings. Tow consists of the short fibres of the flax, which are removed in the process of hackling. It is used for a variety of purposes.

LINI SEMINA, L. E. D. Linseed, or the seeds of the flax plant, are small, compressed, oval-pointed, with sharp margin, brownish-coloured, smooth and shining on the outside, but white internally, without odour. The outside has a bland mucilaginous taste, as the skin of the seed is covered with condensed mucus; the white part, or almond of the seed, has an oily taste, from containing fixed oil, which is separated by expression.

The seeds, analysed by Meyer, consist in 100 parts, of 15·12 Mucilage (nitrogenous mucilage with acetic acid and salts, *p.*), chiefly in the seed-coat, 11·26 fatty Oil in the nucleus. In the *husk* Emulsin 44·38, besides Wax 0·14, acrid soft Resin 2·48, Starch with Salts 1·48. In the *nucleus*, besides the Oil, Gum 6·15, Albumen 2·78, Gluten 2·93, also Resinous colouring matter, 0·55, yellow Extractive with Tannin and Salts (nitre and the chlorides of potassium and calcium) 1·91, sweet Extractive with Malic acid and some Salts 10·88.

The condensed mucus which abounds in the testa of the seed is readily acted on by hot water, and a viscid mucilaginous fluid is formed, in which are two distinct substances, one completely dissolved, analogous to gum (Arabine), and the other merely suspended, and considered by Berzelius as analogous to Bassorine. Alcohol produces a white flaky precipitate in mucilage of Linseed, and Acetate of Lead a dense precipitate.

Action. Uses. Emollient, Demulcent; may be employed in the form of infusion.

INFUSUM LINI COMPOSITUM, L. Infusum Lini, E.

Prep. Digest *Linseed bruised* ʒvj. *Liquorice-root sliced* ʒij. *boiling Aq. dest.* Oj in a covered vessel for 4 hours, near the fire, and strain.

A simple infusion may be formed by merely steeping half an ounce of the seeds in a pint of boiling water, and rendering it more palatable by the addition of sugar and some aromatics, as mint, lemon-peel, &c. The decoction is more suitable for fomentation and enemata, as it separates more of the oil, but is on this very account less agreeable for internal use.

D. f℥jß. ad libitum.

Inc. Alcohol and metallic salts.

OLEUM LINI, L. E. D. Linseed Oil.

The oil contained in the kernel of the seeds, and obtained from them by expression, may be either cold-drawn, or, as usually obtained, after the seeds have been subjected to a heat of 200°. The former, as in the case of cold-drawn castor oil, is paler, with less odour, and taste, than Linseed oil prepared by heat. This is of a deep yellow or brownish colour, of a disagreeable smell and taste; Sp. Gr. 0·932; soluble in alcohol and ether, differing from other oils especially in the property of drying into a hard transparent varnish,—a peculiarity which is increased by boiling the oil, either alone, or with some of the preparations of Lead.

Linseed Oil, according to Dr. Sace, is composed of Margarine and Oleine in nearly equal equivalents. But the Oleic acid of Linseed differs from that of other fatty bodies. The formula of the anhydrous acid is $C_{46}H_{38}O_5$. The Margaric′ is as usual composed of $C_{34}H_{33}O_3$. The Glycerine obtainable from Linseed oil in large quantities is also similar to that procured from other fats.

Action. Uses. Emollient and Cathartic. Chiefly used externally. *D.* f℥iv.—f℥j.

FARINA LINI, E. Linseed Meal.

Linseed, after having had the oil expressed from them, are in the form of a flat mass, commonly called *oil-cake*. This being reduced to powder, forms Linseed Meal, E., which is employed for making the Linseed Meal Poultice.

CATAPLASMA LINI, L. Linseed Meal Poultice.

Prep. Take of *boiling Water* f℥x., and mix with it *Linseed powdered* ℥ivß., or as much as may be sufficient to make a poultice.

Here the internal oleaginous and external mucilaginous parts being all ground up together, and their properties elicited by the hot water, an admirable mixture is produced for making an excellent and readily made emollient poultice.

The Linseed Meal sold in France has been found adulterated with some refuse oil seed powder, mixed frequently with a little bran, oatmeal, and almond powder, with the refuse of starch manufactories, and often some rancid oil.

LINUM CATHARTICUM, E. Purging Flax.

This is a small inconspicuous plant which grows plentifully on dry heaths throughout Britain. It has long enjoyed the reputation of a popular purgative, and is still officinal in the E. P.

MALVACEÆ, *Brown.* Mallow Worts.

From the name this might be supposed to be a European family, but the species abound in the tropics both as trees and herbs, and diminish in number and size as they approach the poles. The species (about 600 in number) are almost all mucilaginous, and yield tenacious fibre. A few are employed as articles of diet.

MALVA, E. Malva sylvestris, *Linn.* Herb. Common Mallow. *Monadelphia Polyandria*, Linn.

The Mallow is found in most parts of Europe, by hedges, roads, and in waste places, flowering from June to August. It is the Μαλαχη κηπευτή of Dioscorides.

The root is perennial and branched. The stem erect or ascending, branched, the petioles and peduncles hirsute, leaves 5 to 7 lobed, plaited and with serrated margins, acute, peduncles axillary crowded and erect, even after flowering. Calyx usually surrounded by three narrow bracteoles, and much smaller than the petals, which are rose-coloured and purple-veined, the valves of the carpels margined, reticulated and rugose when ripe.—E. B. t. 671.

Prop. Common Mallow, like the round-leaved and other species, is without odour, but has a mild mucilaginous taste, imparting this property to water, which dissolves the mucilage, its chief constituent, along with a small portion of bitter extractive. Either this or *M. rotundifolia* was employed as an esculent vegetable by the Romans.

Action. Uses. Demulcent. Its infusion sweetened with Sugar may form a useful drink in some complaints. The Decoction may be similarly employed, either for fomentation or injection, or the herb may be formed into an emollient cataplasm.

ALTHÆA, L. E. Althæa officinalis, *Linn.* Radix, L. Leaves and Root. E. Marsh Mallow. *Monadelphia Polyand.* Linn.

This plant (Fig. 46) is found in marshy situations in this country and on the Continent, and is the Αλθαια of Dioscorides, the Guimauve of the French.

The root is perennial, tap-shaped, whitish, and the stems erect, soft and hairy. The leaves soft and woolly on both sides, unequally crenate, cordate or ovate in shape, the lower 5 and the upper 3-lobed; peduncles axillary, many-flowered, much shorter than the leaf. Flowers of a pale bluish colour. Calyx double, the exterior (v. 4) involucel 6 to 9-cleft, the (3) interior 5-fid. Stamens (2) numerous, filaments united into a tube. Styles (1) numerous, united together near the base. Carpels arranged as in Malva.—E. B. t. 147.

Prop. Marsh-mallow roots, as usually seen, are whitish, being deprived of their epidermis; outside they are naturally of a dirty yellow colour, but white on the inside, long, fusiform, fleshy, and, like

the leaves, without odour, but having a bland, mucilaginous, or rather a viscous taste.

Chem. Marsh-mallow roots analyzed, yielded to Buchner, Mucilage and Starch in large proportions; hence Iodine strikes with them a blue colour; and the Sesquichloride of Iron forms in the decoction a

Fig. 46.

brown semitransparent mass (*p*); they contain *Altheine*, first discovered by M. Bacon, and since ascertained by M. Plisson to be identical with Asparagine, which is crystalline, without odour, and nearly tasteless, soluble in water and in proof Spirit, but insoluble in Alcohol and Ether.

Action. Uses. Demulcent, Emollient. Used in the form of Decoction, Syrup, and Lozenge.

MISTURA ALTHÆÆ, E.

Prep. Boil *Althæa-root* ℥iv. *Raisins stoned* ℥ij. in *Water* Ov. down to Oiij. Strain, and when the sediment has subsided, pour off the clear liquor for use.

A pleasant Diluent and Demulcent, of which a pint or two may be taken daily.

SYRUPUS ALTHÆÆ, L. E. Syrup of Marsh-mallow.

Prep. L. Macerate *Marshmallow-root* dried and sliced ℥iß. in (cold) *Dist. water* Oj. for 12 hours. Press out the liquor, and strain through linen. Then add *Sugar* ℔iij., or twice the weight of the strained liquid, and dissolve with a gentle heat. Lastly, when the syrup has cooled, add *Rectified spirit* f℥ß. to each f℥j. E. The root is boiled, and no spirit is added.

D. fʒj. to fʒiv. Chiefly added to mixtures to allay irritation of cough.

GOSSYPIUM, E. The Hairs attached to the Seeds of *Gossypium herbaceum* and other species of the genus. Raw Cotton.

Cotton has been characteristic of India from the earliest times. The first distinct notice of it is in the Book of Esther, i. 6, where its Sanscrit name *Karpas* is translated *green* in our Bible. Herodotus and Ctesias notice it, but it was not till the invasion of India by Alexander that the Greeks were acquainted with the plant, as may be seen in Theophrastus, and also in Pliny. Europe is now supplied chiefly from America, where two distinct species are indigenous: *G. Barbadense*, yielding the Cotton from the United States, and *G. Peruvianum* or *acuminatum*, that which is produced in South America. India also has two distinct species, *G. herbaceum* or *Indicum*, the common Cotton of India, which has spread to the south of Europe, and *G. arboreum*, or Tree Cotton, which yields little if any of the cotton of commerce. (This is very distinct from the species of Bombax often called Cotton-tree and Silk Cotton-tree).

The species consist of large or small shrubs, and one forms a tree. All have alternate leaves, which are more or less palmate or lobed, and usually covered, as well as the young branches, with little black dots, and the nerves below have one or more glands. The calyx is double; the exterior involucel is larger than the interior, divided into three large leaflets, cordate at the base, entire, toothed, or deeply cut along the margin. The interior or true calyx is one-leafed, cup-shaped, and with an obtusely quinquifid margin. The flowers are large and showy, more or less yellow or red, consisting of five petals united at their base, subcordate, flat and spreading. Stamens numerous, filaments united below and adhering to the petals, free above, with small kidney-shaped anthers. Ovary superior. oval, roundish or pointed, terminated by a style, which passes through the cylinder formed by the stamens, marked with three or five furrows towards its apex, and dividing into three, sometimes into five stigmas. The capsule is roundish, oval, or pointed, three to five celled, and three to five valved at the apex, with loculicidal dehiscence. Each cell contains from 3 to 7 ovoid seeds, from the seed-coats of which arises the filamentous substance, which by its twisting envelopes the seeds. Along with this Cotton there is often a shorter covering, called *fuzz* by planters.

Action. Uses. Cotton plants are mucilaginous, and have been used as Demulcents. The seeds yield Oil, which is sometimes expressed for burning in lamps. Cattle are, however, often fed on the seeds, which are also sometimes employed as manure for Cotton plants. Cotton wool is formed of tubular hairs, which in drying become flattened; they are transparent, without joints, and twisted like a cork-

screw. Under water they appear like distinct, flat, narrow ribands, with occasionally a transverse line, which indicates the end of a cell. This twisted nature of the Cotton fibre is probably the reason why Cotton cloth is not so well fitted as linen for surgical dressings. But being a worse conductor of heat than linen, it is well suited for inner clothing, where the object is to preserve uniformity of temperature, as it will retain heat, and prevent the body from being so readily affected by external heat or cold. At the same time that it condenses less freely than linen the vapour of perspiration, it absorbs it readily when it has been condensed into the form of sweat. For these reasons probably it is that thick calico shirts, &c. have been introduced into the army for the use of soldiers. Cotton has long been a popular application to burns. Dr. Anderson (Ed. M. and S. Journ. 1828) directs it to be applied in thin layers, one over the other, and retained by the moderate pressure of a bandage. Pain is allayed, local irritation and blistering diminished or prevented, and constitutional disturbance proportionally obviated. M. Reynard adopted its application in cases of Erysipelas, and M. Mayor employs it as a topical application with Calomel in cases of Ophthalmia. (B. and F. Med. Rev. xx. 463.)

BÜTTNERIACEÆ. *R. Brown.*

Theobroma Cacao, Cocoa or Cacao-tree, though not officinal, is interesting in consequence of its seeds being largely employed in diet. The tree is a native of Mexico, but extensively cultivated in the West India Islands, and remarkable for its large and oval, yellow, cucumber-like capsules, hanging from the sides of the trunk and branches. These are divided into 5 cells, each filled with 8 to 10 ovoid seeds, piled one upon another, and covered by a membranous and succulent aril. There are several varieties of these seeds or *nibs*, which are more or less esteemed. The kernels of the seeds yield by pressure about one half their weight of a fatty oil, commonly called *Butter of Cocoa*, at one time much lauded for its medical properties. The seeds, pounded, digested, and boiled with water, with the oil skimmed off, and sweetened with sugar and milk, afford a wholesome and agreeable beverage. The COCOA sold in the shops consists either of the roasted kernels and husks, or of the husks only, ground to powder; it is sometimes made from the cake left after expressing the oil from the beans. "Much of the cheap stuff sold under this name, is very inferior, being made with damaged nuts that have been pressed for the oil, mixed with potato-flour, mutton-suet, &c." (*Cooley.*) *Flake Cocoa* is Cocoa ground, compressed, and flaked by machinery. CHOCOLATE (from the Indian name *chocolat*) is made by triturating in a heated mortar the roasted seeds without the husks, 10 lbs., with an equal quantity of Sugar, about $1\frac{1}{2}$ oz. of Vanilla, and 1 oz. of Cinnamon (*Cadet*), into a paste, which is put up in various forms.

"The mass of the common Chocolate sold in England is prepared from the cake left after the expression of the oil, and this is frequently mixed with the roasted seeds of ground peas and maize, or potato-flour, to which a sufficient quantity of inferior brown sugar, or treacle and mutton-suet is added, to make it adhere together." (*Cooley.*)

Action. Uses. Both Cocoa and Chocolate form the basis of very nourishing and agreeable beverages (whence the name of Theobroma, or food for the gods) devoid of the stimulating properties of Tea and Coffee, but apt to disagree with some people and with many Dyspeptics, in consequence of the quantity of oily matter they contain.

CISTINEÆ, *Dec.*

The CISTINEÆ, or *Rock Rose tribe*, include plants, some of which used to be officinal in consequence of yielding LADANUM, a fragrant resin, formerly much celebrated, but now little employed. It is procured in the Levant from species of Cistus, such as *C. creticus*, *C. odoriferus*, &c., and can only be obtained pure in the situations where it is produced. It has a very agreeable smell, from the presence of a volatile oil. It was formerly employed as a stimulant, more recently as an expectorant, and continues to be esteemed by the Turks as a perfume, and used as a fumigation.

DIPTEROCARPEÆ. *Blume.*

The Dipterocarpeæ, so named from some of the divisions of the calyx being extended into long wing-like bodies, require to be noticed, as one of the species, *Dryobalanops aromatica*, Gærtn., *D. Camphora* (*Colebr.*), has been erroneously supposed by some to be the plant yielding the Camphor of European commerce. This drug is produced by one of the tribe of Laurels, the *Camphora officinarum* of Nees v. Esenbeck (*v.* Laurineæ). But the kind called Sumatra or Borneo Camphor, as well as Liquid Camphor, is produced by the above tree, which is a native of Sumatra and Borneo. On the coast of the former island it is one of the largest of trees; and the same tree, it is said, which yields the oil, would have produced the Camphor, if unmolested. This kind is not seen in European Commerce, because the Chinese give eighty or a hundred times more money for it than that for which they sell their own Camphor. Specimens of both the Sumatra Camphor and of the Liquid Camphor are in the Museum of King's College, having been presented by Mrs. Marsden.* (See Vreise; Mottley, in *Hooker's Journal of Botany;* and *Pharm. Journal*, vol. xii. Nos. I. and VI.)

* Several other important products are yielded by the Dipterocarpeæ; as Wood-oil, which contains a principle analogous to Balsam of Copaiva—the Resin or Dammer of Shorea robusta—Indian Copal (sometimes mixed with Amber and sold as such), which is the Liquid Varnish, inspissated, of the Piney-tree, or Vateria indica; of which the fruits yield to boiling water the esteemed and valuable vegetable Butter of Canara.

Action. Uses. The Liquid Camphor or Oil might no doubt be beneficially employed for the same purposes as Cajaputi oil and Grass oil. The Sumatra Camphor does not appear to be preferable to that of China.

THEACEÆ, *Mirbel.* CAMELLIEÆ, *Dec.*: a tribe of TERNSTRŒMIACEÆ.

The genus Thea forms a small group of plants with Camellia, and is remarkable for containing the plant or plants which yield the different kinds of Tea imported from China. The question was long undecided whether all the kinds of Tea were made, or could be made, from the same plant, by variations in the process; or whether it was preferable to have different varieties or kinds of plant for the distinct varieties of Tea, as, for instance, the Green and Black Teas; whether these were originally distinct species, or varieties owing to differences in soil, climate, or culture. The author had always been inclined to think the latter the more probable opinion, as fully detailed in his "Illustr. of Himalayan Botany," pp. 107 to 128, and in his "Productive Resources of India," pp. 252 to 311. Two plants are known in the gardens: one of which, called *Thea viridis*, was supposed to yield only Green Tea, including—1. Imperial. 2. Gunpowder. 3. Hyson. 4. Young Hyson. 5. Twankay. This kind is capable of withstanding a greater degree of cold, and survives through the winter in the open air in this country, as may be seen in Kew Gardens. Green Teas we know are chiefly produced in the more northern districts of China. Some are factitiously coloured with Indigo and Sulphate of Lime, and Mr. Warrington has ascertained that of the Green Teas of commerce some are *unglazed*, others *glazed*. The former are of a yellow-brown tint, tending on the rubbed parts to a blackish hue without a shade of green or blue; while the *glazed* are faced or covered superficially with a powder consisting of Prussian Blue and Sulphate of Lime, or Caolin, with occasionally a yellow or orange-coloured vegetable substance (Turmeric?) Indigo with Gypsum is sometimes used, as by the China tea-makers sent to Assam. Even the *unglazed* have a little Sulphate of Lime attached to their surface, either to act as an absorbent of moisture, or to give the bloom characteristic of the green teas of commerce. The *Thea Bohea* appears distinct as a species from the former, and has been supposed to yield the different kinds of Black Tea, that is, Pekoe, Lapsang, Souchong, Congou, Bohea, &c., the last being the inferior, and the Pekoes the best kinds of Black Tea. Plants collected in Chusan are somewhat intermediate in character. That growing wild in Assam is considered by some botanists to be another distinct species of Thea or of Camellia. Mr. Ball has fully explained, in his work on the subject, the processes of manufacture by which both Black and Green Teas are produced from the leaves of the same plant. Mr. Fortune (*Visit to the Tea Countries of China*) has placed beyond a doubt the fact that all the best Black and Green Teas are

prepared by the Chinese from the leaves of varieties of T. viridis, which alone are cultivated in the north of China. T. bohea is chiefly grown in the neighbourhood of Canton. The difference between Black and Green Tea mainly depends upon the fact of the Black Tea leaves having been exposed to the air, and suffered to undergo a kind of fermentation, before the process of heating.

Some Tea has been manufactured in the Government Nurseries in Kemaon from plants grown from China seed, which has been pronounced of the finest quality by the best judges, and compared with the Oolong Teas of the Ankoy district. Some prepared in August, 1845, in the Tea Nursery in the Deyra Doon, has also been pronounced of fine quality, and compared with Orange Pekoe.

The properties of Tea depend chiefly on the presence of Tannin, of a Volatile Oil, and of a principle called *Theine* ($C_8 H_5 N_2 O_2$), which has been found to be identical with *Caffeine*, and is a salifiable base. It may be obtained in white silky needles, has a mild bitter taste, is soluble in hot water, but sparingly so in cold water and Alcohol. With S′ and H Cl it forms crystalline compounds, and is supposed to exist in Tea in combination with Tannic Acid. The quantity of Tannin is stated by Brande, and it appears by the taste, and in the analyses of Mulder, to be greater in Green than in Black Tea. Sir H. Davy and others have stated that Black Tea contains the largest proportion of Tannin. The volatile Oil is in larger quantity in the Green than in the Black Tea.

Tea is well known for its astringent and moderately excitant properties, chiefly affecting the nervous system, producing some degree of exhilaration, and of refreshment after fatigue. Its effects are well seen in the wakefulness produced, especially by Green Tea, in those unaccustomed to its use. But it is thought by some to act as a sedative on the heart and blood-vessels; as Dr. Billing explains it, Tea and Coffee are sedatives, and relieve the stupor produced by stimulants, or the drowsiness of fatigue, or other plethora, only by counteracting the plethoric state of the brain induced by the continued stimulation of action,—thus restoring this organ to its normal state. Liebig (*Anim. Chem.* p. 179) has suggested that *Theine*, as an ingredient of diet, may be useful in contributing to the formation of Taurine, a compound peculiar to Bile. Besides being useful as a diluent, it may often be prescribed as an agreeable and refreshing beverage; in some cases, especially when made strong, acting as an excitant, and at other times producing sedative and calming effects.

AURANTIACEÆ, *Correa.*

The Aurantiaceæ are natives of tropical Asia, with a few species in Madagascar. Limonia (now *Skimmia*) Laureola is alone found in cold situations in the Himalayas; but many are cultivated in all parts of the world. A fragrant volatile oil abounds in many parts, with a bitter principle in the rind of the

fruit, and an acid or saccharine juice in the fruit. Several species of the genus Citrus are officinal.

CITRUS, *Linn.* *Polyadelphia Polyandria*, Linn.

Flowers frequently with a quinary proportion of parts. Calyx urceolate 3 to 5 cleft. Petals 5 to 8, or only 4. Stamens 20 to 60, their filaments compressed and more or less united at the base into several bundles, often 4 or 5 of them free. Anthers oblong. Style round, crowned by a hemispherical stigma. Fruit baccate, 7—12 celled. Seeds 4 to 8 in each cell, with numerous separate small bags of pulp. Seeds without albumen, seed-coat membranous, marked externally with the raphe and internally with the chalaza. Auricles of cotyledons very short. Trees or shrubs with axillary spines. Leaves compound, but often reduced to a single terminal leaflet which is jointed with the petiole, and often winged. *v.* Fig. 47.

CITRUS BIGARADIA, L. D. Citrus Vulgaris, E. Seville or Bitter Orange. Fructûs Cortex Exterior, L. E. D. Aurantii Floris Aqua, L. E.; Distilled Water of the Flowers. A. Oleum, E. D.; Volatile Oil of the Flowers; Neroli Oil.

This, which is called Citrus Bigaradia by Duhamel, and also by Risso in his work on Oranges, is supposed to have been introduced by the Arabs; because all the old established groves of Spain, as those at Seville, planted by the Moors, are of the Bitter Orange (*Macfadyen*).

The tree is erect in habit, smaller than that of the Sweet Orange, but the flowers more fragrant. The branches are spiny. Leaves elliptical, acuminate, slightly toothed. Petioles more or less winged. Flowers large, white. Fruit uneven, more or less round, of a dark orange colour; rind with concave vesicles of oil; pulp acid and bitter.—Risso.

AURANTII CORTEX, L. E. D. Rind of the Bitter Orange.

The Rind of the Seville Orange is officinal, because it is more bitter than that of the Sweet Orange, and possesses at the same time a considerable degree of aroma from the presence of volatile oil. But as the outer part alone possesses these properties, the white inner part should be removed when it is used officinally for the following preparations in its fresh state, or when intended to be dried.

CONFECTIO AURANTII, L. Conserva, E. Confection of Orange Peel.

Prep. Rub up in a stone mortar with a wooden pestle *fresh rasped Orange Peel* ℔j. add *Sugar* ℔iij. Pound till incorporated.

Action. Uses. Stomachic. An agreeable vehicle for prescribing tonic or purgative powders.

SYRUPUS AURANTII, L. E. D. Syrup of Orange Peel.

Prep. L. D. Macerate *dried* (*bitter*) *Orange Peel* ℥iiß. in boiling *Aq. dest.* Oj. in a closed vessel for 12 hours. Press out the liquor, and boil it for 10 minutes. Strain. Add *Sugar* ℔iij. and dissolve with a gentle heat. (The L. P. directs

the addition of *Spirit,* as to Syrupus Altheæ.) E. The same quantity of *fresh* peel is ordered; the product is therefore weaker.

Action. Uses. An agreeable stomachic, useful as an addition either to disagreeable or to tasteless draughts.

INFUSUM AURANTII COMPOSITUM, L. D. Inf. Aurant. E. Compound Infusion of Orange Peel.

Prep. L. E. Macerate for ¼ of an hour in a covered vessel *dried Orange Peel* ℥ß. *Lemon Peel* ʒij. *bruised Cloves* ʒj. *boiling Aq. dest.* Oj. Strain. D. No Lemon-peel.

Action. Uses. Warm Tonic. Excellent vehicle for either acid, alkaline, or saline medicines, in doses of f℥iß. two or three times a day.

TINCTURA AURANTII, L. E. D. Tincture of Orange Peel.

Prep. L. Macerate for 7 days *dried* (bitter) *Orange Peel* ℥iijß. in *Proof Spirit* Oij. Press and strain. E. D. Similar: the E. P. states that it may also be prepared by percolation.

Action. Uses. Tonic adjunct to draughts and mixtures, in doses of fʒj.—fʒiv.

AURANTII FLORIS AQUA, L. Aurantii Aqua, E. Orange Flower Water.

In the lists of Mat. Med.

Procured by the same process as that by which the Essential Oil is obtained, particularly in Italy and France. Besides Essential Oil, it also contains some Acetic′. It may be prepared extemporaneously by agitating some of the Volatile Oil with distilled water, and then filtering. But it is usually imported.

Mr. Squire (Br. An. of Med. i. p. 15) discovered that Orange Flower Water, which is imported from France in vessels of lead or Copper soldered with lead, contains often some of the latter metal. This may be detected on the addition of a soluble Iodide, golden-coloured crystals of Iodide of Lead being deposited. He recommends the purification of the water by the immersion of a piece of Zinc wire, and then testing with Iodide of Potassium. The water should be nearly colourless, and unaffected by Sulphuretted Hydrogen, L. E. If either Lead or Copper is present, a blackish-coloured precipitate will be produced.

AURANTII OLEUM, E. D. Oleum e Floribus destillatum. Volatile Oil of the Flowers, E. Oil of the Rind, D. Oil of Orange Flowers. Oil of Neroli. In the List of Mat. Med. E. P.

A Volatile Oil being secreted in the flowers and other parts of both kinds of Oranges, is separated by distilling them with water. This is

well known in France by the name of Neroli. It has a sweet aromatic odour different from that of the flower, and appears to Soubeiran to be a modification of the natural essential oil. Neroli contains a solid crystallizable oil, which has been called *Aurade* by Plisson, who discovered it. The Neroli obtained from the Bitter Orange is finer than that obtained from the Sweet Orange. But an essential Oil, known as Oil of Orange, is also obtained by distillation from the leaves of the Orange, and even by expression of the grated rind (D. P.).

Action. Uses. The Essential Oil is stimulant and antispasmodic. Orange-flower water is considered in France to be possessed of anodyne and antispasmodic properties, and is in constant use in doses of f℥j.—f℥ij. in nervous and hysterical cases.

CITRUS AURANTIUM, *Risso*, L. E. D. Common or Sweet Orange. Aurantii Fructus, D.; the fruit. A. Floris Aqua, L. E.; Orange-flower water. A. Oleum, E.; vol. oil of the flowers; Neroli Oil.

The Orange, like the Lemon, is a native of India, being found in the forests on the borders of Silhet, and on the Nielgherries; perhaps also in China. The Sanscrit *Nagrunga* and the Arabic *Narung* are no doubt the European names of *Naranja* (Spanish), *Arancia* (Italian), whence we have *Aurantium* and *Orange*. The orange is not mentioned either by the ancients or the Arabian medical authors. It is supposed to have been introduced into Europe after the middle ages.

The Orange-tree attains a height of 16 or 20 feet, and bears great abundance of fruit. It is remarkable, as well as others of the genus, for bearing the fruit at all ages at the same time with the flowers. Though a native of India, it does not ripen its fruit there until the winter, and hence has been able to travel so much further north than others of its compatriots. Leaves coriaceous, ovate-oblong, acute; margins usually finely toothed; petioles margined, sometimes winged. Petals 5, white. Stamens about 20, 5 of them often distinct and appressed against the stigma, the remainder in 5 bundles alternating with them. Fruit globose, rind thin, with convex oil vesicles, adhering loosely to the pulp, which is sweet.

Oranges are cultivated in the south of Europe and in the Azores, whence they are largely imported into this country. The parts and products which are officinal are the fruit, D.; the distilled water of the flowers, L. E.; and the Essential Oil of the flowers, or Neroli, E. D. Orange-flower water and Neroli Oil are also obtained from the flowers of the Seville or Bitter Orange, q. v.

The fruit of the Sweet Orange, and the flowers and Essential Oil of both species, were officinal in the L. P. of 1836, but are now omitted.

AURANTII FRUCTUS, D. The ripe fruit of the Orange is well known for its extremely agreeable and refreshing juiciness, whence it is so much esteemed as a fruit even for the sick, and as a refrigerant. When of a small size, the fruit which falls off is dried, and forms the

Aurantii baccæ or Curaçoa Oranges, so called from being employed in flavouring Curaçoa. The smaller ones are smoothed, and used for making issues. The rind or peel of the fruit is sometimes substituted for that of the Bitter Orange, as are also the flowers and their essential oil, the oil expressed from the grated rind, and Orange-flower water; all being used for the same purposes as those produced from the Bitter Orange.

CITRUS LIMETTA, *Risso*. var. BERGAMIUM. Bergamotæ Oleum, E. Oil or Essence of Bergamot. Oleum è fructûs cortice destillatum. Volatile Oil of the rind of the Fruit. Fr. *Limette et Bergamotte.*

The above is the species which yields Oil of Bergamot. It appears to belong to the same species as the *Citrus acida* of Roxburgh, as this comprehends under it varieties of the sour Limes as well as the sweet Limes found in India. Latterly Risso and Poiteau have separated the C. Limetta from the C. Bergamia.

The leaves of the latter are oblong, more or less elongated, acute or obtuse, under side somewhat pale. Petiole more or less winged and margined. Flowers usually small, white. Fruit pale yellow, pyriform or depressed: rind with concave vesicles of oil: pulp more or less acid.—Wight and Arnott, Prod. p. 96.

Bergamot is the Volatile Oil of the rind of the fruit of the above variety, which is cultivated in the south of Europe, especially in the neighbourhood of Nice. Raybaud states that 100 fruits yield $2\frac{1}{2}$ ounces of the oil by expression, which has a density of 0·88, is of a pale yellow colour, and very fragrant. It differs from the other volatile oils of this genus in containing Oxygen. It is believed to contain a mixture of oils, having the composition of Citrene with a Hydrate of such an oil, and an oxygenated oil formed by the action of the atmosphere. (*Liebig.*) From its agreeable fragrance, it has been much employed by perfumers, and was made officinal in the L. P. of 1836, for the purpose of forming an agreeable addition to mixtures and unguents. It may be substituted for the Oil of Lemons, or this may be used instead of that.

CITRUS MEDICA, *Risso*, E. The Citron. Fr. *Cedrate.*

Citrus Medica of botanists is the Citron, distinguished by its large ovoid fruit, with extremely thick rind and proportionately small quantity of acid juice. This name has been erroneously applied to the species yielding Lemons; a mistake which has been corrected in the last edition of the D. P. The rind is thick and spongy internally, tuberculated externally, and covered with numerous dots filled with essential oil (*huile de cedrat*). Its pulp is less acid and juicy than that of the Lemon. The rind of the fruit is preserved, and its essential oil separated; the juice may be employed for the same purposes as that of the Lemon.

CITRUS LIMONUM, *Risso*, L. E. D. The Lemon. Fr. *Citron* or *Limon*. Limones, E. D. The Fruit. Lemons *and Limes*, E. Limonum Succus, L. D. The Juice of the Fruit. Limonum Cortex, L. E. D. Lemon Peel; the rind of the fruit, fresh, and dried. Limonum Oleum, L. E. D. Volatile oil, expressed from the rind of the fruit.

Lemons were unknown to the ancients and also to the Arabs, though noticed in Persian works on Materia Medica by the names *Leemoo* and *Neemboo*, and stated to be natives of India, where they are indigenous, and known by nearly the same names. The author has found the tree apparently wild in the forests at the foot of the Himalayan mountains. The annexed figure (47) is from one of these plants. Limes are produced by a distinct species, *Citrus acida*, and not by *C. Limonum*, as stated by the E. P.

Fig. 47.

They form shrubs of from 10 to 15 feet in height, much branched, with stiff awl-shaped thorns Leaves oval, oblong-oval; margin serrulate, or slightly toothed; petioles with a narrow leafy border, or simply margined. Flowers with 5, sometimes 4 petals. Stamens 20 to 30, in 4 or 5 bundles. Fruit of a light yellow colour when quite ripe, ovoid in shape, with a more or less nipple-like knob at the apex. Rind thin with numerous vesicles of oil, adhering closely to the pulp, which is very acid.

Though Lemons are originally natives of India, they are now imported into this country from the south of Europe and the Azores, each being separately rolled up in paper. The best plan "consists in packing them with newly slaked lime in bottles or earthen-ware jars, the mouths of which are secured with corks and wax." (*c.*)

LIMONUM CORTEX, L. E. D. Lemon Peel is of a light yellow colour, but becomes of a brownish hue when dried. It is bitter and aromatic, from containing some Bitter Extractive which is insoluble in Ether, but soluble in Alcohol; and abundance of fragrant Volatile Oil, stored up in the numerous vesicles with which the rind is studded. It forms an agreeable addition to different tinctures and infusions, and is an ingredient in the *Inf. Aurantii Compositum*, and *Inf. Gentianæ Compositum*, L.

LIMONUM OLEUM, L. E. D. Oil of Lemons. This, like the Oil of Orange, may be obtained either by distillation, or by simple expression of the finely grated rind. The latter is of the finest quality, of a light colour, and fine lemon odour, warm penetrating taste. Sp. Gr. 0·848 to 0·85 and higher, boils at from 330° to 353°, being a mixture of two oils, which may be separated by distillation to a certain extent. One of them, Citrene, has the Sp. Gr. 0·847, and boils at 330°; the other, Citrelene, has the Sp. Gr. 0·88, and boils at 345° to 353°. (Liebig, in *Turner's Chem.*) Both these and the Oil of Lemons have the composition of the Oil of Turpentine, and are probably composed of $C_{10}H_5$. They are, therefore, when pure, true Hydrocarbons. Oil of Lemon absorbs Oxygen when exposed to the atmosphere. Acted on by Hydrochloric acid, it forms two compounds, one a liquid, the other an artificial Camphor composed of $C_{10}H_8+HCl$. The Oils of Oranges and of the Citron are identical in composition with Oil of Lemons.

LIMONUM SUCCUS, L. D. Lemon Juice is obtained by subjecting the pulp, freed of its rind and seeds, to pressure, whether on a large scale, or for ordinary purposes. It is allowed to stand for a few days in a cool place, and then decanted and filtered. It however remains a little turbid, is sharply acid, with an agreeable flavour and a little of the odour of the Lemon. It consists of Citric acid (about 1·77 per cent.) dissolved in water with mucilage and extractive. It is apt to undergo decomposition, but with care may be preserved for a considerable time, as by corking it up in full bottles, or pouring a layer of almond oil above it; some subject it to a slight ebullition, or concentrate by freezing: "The British navy is supplied with it from Sicily, preserved by the addition of $\frac{1}{10}$ of strong brandy; druggists in this country preserve it by adding about $\frac{1}{10}$ of spirit of wine, and filter off the mucilage which separates." (*c.*) A substitute may be formed for it by dissolving ℥xjß. of *Cit'* in *Aq. dest.* Oj., and flavouring with the smallest quantity of Oil of Lemons. (*Phillips.*)

Action. Uses. Refrigerant, Antalkaline, Antiscorbutic. Diluted with water, it forms a refreshing drink in hot climates, or in febrile and inflammatory complaints, made more agreeable with sugar, in the well-known form of Lemonade, or added to barley, rice-water, &c. It is much employed in making effervescing draughts; in imitation of which *Effervescing Lemonade* is prepared by the soda-water manufacturers. The Citrates and Tartrates are converted into Carbonates in passing through the system, and will produce an alkaline reaction on the urine. Antiscorbutic: hence about ℥j. or ℥ij. are distributed to seamen in long voyages as a prophylactic, or f℥iv.—f℥vj. for the cure of Scurvy. Citric acid is sometimes substituted for it.

Artificial Lemon Juice may be made by dissolving Citric or Tar′ ℥iiß. Gum ℥ß. Fresh Lemon Juice ʒvj. fine Sugar ℥ij. Aq. ferv. Oij. Allow it to cool and strain.

Lemonade. Macerate 2 *Lemons* sliced and *Sugar* ℥ij. in *Aq. ferv.* Oj. till cool, and strain.

Aerated or Effervescing Lemonade. Mix *Water* Oj. charged with five times its volume of *Carb′ gas* with *Syrup of Lemons* f℥ij.

Tinctura Limonum, L. D. Tincture of Lemon Peel.

Prep. L. Macerate *fresh Lemon-peel* ℥iijß. in *Proof Spirit* Oij. for 7 days, and strain. D. ℥x. to Oij.

An agreeable preparation, which, containing both the oil and bitter of the Lemon-peel, is aromatic and tonic.

D. fʒj.—fʒiij.

Syrupus Limonum, L. E. Syrup of Lemons.

Prep. L. Boil *strained Lemon-juice* Oj. for ten minutes, and strain. Add to this *Sugar* ℔iiß. and dissolve. Lastly, when the syrup has cooled, mix in *Rect. Spirit* f℥iiß.

E. Similar: no spirit.

Action. Uses. An agreeable addition to diluent drinks or to draughts, in doses of fʒj. to fʒiv.

Acidum Citricum, L. E. D. Citric Acid. A crystallizable acid prepared from the Juice of the fruit of *Citrus Limonum*, and other species. Concrete Acid of Lemons. *F.* Acide Citrique. *G.* Citronensaüre.

Citric Acid is that which gives the sour taste to the juice of the Lemon and Lime, and has been so named from Citrus. It is also contained in the juice of some other fruits, as in acid Grapes, in Tamarinds, in the Gooseberry, Red Currant, Cranberry, Bird-Cherry, usually mixed with some Malic acid, sometimes combined with Potash or with Lime. In the juice of Lemons and Limes it is in a free state, mixed only with mucilage and similar vegetable impurities, which prevent its crystallizing. It was first separated from these and obtained in a solid

form by Scheele in 1781. To separate the Citric acid from the admixtures, Lime may be presented to it. With this it combines, and is precipitated in the form of Citrate of Lime. This is separated and decomposed by dilute Sulphuric acid, when an insoluble Sulphate of Lime is formed, and the Citric acid becomes dissolved. Lemon Juice is sometimes imported instead of the Lemons, and the acid is often imported in the form of Citrate of Lime.

Citric acid is inserted in the lists of Mat. Med. of the L. and D. P.

Prep. E. Take of *Lemon-juice* Oiv.; *Prepared Chalk* ℥ivß., or a sufficiency; *Dil. Sulph. acid* f℥xxxvj., or in the same proportion to the chalk required. Boil the Lemon-juice, allow it to rest; pour off the clear liquor, boil this again; and add the chalk to it while hot by degrees till there is no more effervescence, and the liquor ceases to taste acid. Collect the precip. and wash it with hot water till the water passes from it colourless. Squeeze the residuum in a powerful press; mix it uniformly with *Dist. Water* Oij.; then add the *Sulph. acid* by degrees and with constant stirring. Try whether a small portion of the liquid, when filtered, gives with solution of Nitrate of Baryta a precip. almost entirely soluble in Nitric acid; and if the precip. is not nearly all soluble, add a little Citrate of Lime to the whole liquor till it stands this test. (By this any excess of Sulph. acid in the liquid is neutralized.) Separate now the clear liquor by subsidence or filtration, washing the insol. matter (Sulph. Lime) with cold water, and adding the washings to the liquor. Concentrate with a gentle heat till crystals form on the surface; set the liquor aside to cool and crystallize; and purify the cryst. by repeated solutions and crystallizations until they are colourless.

When Citric acid is prepared on the large scale, the Carbonic acid which escapes on the addition of the chalk is collected, and applied in the manufacture of Bicarbonate of Soda; also, the Sulphate of Lime which subsequently remains is applied to various economical purposes, among others, to the preparation of Tart. acid. q. v. (P. J. x. 402.)

Citric acid ($C_{12}H_5O_{11} + 3HO = Cit'$) is colourless and transparent, without odour, of a strong but agreeable acid taste, crystallizes in transparent short rhomboidal prisms terminated by four planes, apt to become moist in damp air, soluble in three-fourths of cold and half its weight of hot water. The solution spoils when it has been some time kept, becoming ropy from spontaneous decomposition. Cit′ is also soluble in Alcohol. When heated with Sul′, it is resolved into Carbonic oxide, Carb′, Ac′, and water. Nit′ converts it into Oxalic′, and when melted with caustic Potash, Ox′, Ac′, and water are produced. By heat it is fused in its own water of crystallization, and at a higher temperature decomposed. When obtained at ordinary temperatures, it crystallizes with 5 Eq. of water, two of which are water of crystallization; but when deposited from a solution cooled from 212°, the crystals contain only 4 Eq. Aq. three of which are basic, and 1 Eq. water of crystallization. The effects of heat on Citric′ have been studied by several chemists. The decompositions recounted by Liebig (*Turn. Chem.* 1005) have been cleared up by Crasso. Crystallized Citric′ when exposed to heat, exhibits four stages of decomposition. During the first, the water of crystallization alone is given off, and the residue contains unaltered Cit′. The second stage is characterized

by white vapours, and the production of Acetone, Carb. oxide, and Carb′, while the residue consists of Hydrated Aconitic acid, which is therefore the true Pyrocitric′. In the third stage, the Aconitic′, not being volatile, is itself decomposed, yielding Carb′ and an oily liquid (Citricic′, *Baup*), which Crasso proposes to call Itaconic acid. In the fourth period, empyreumatic oil is produced, and a voluminous coal remains behind. Citric acid forms numerous salts: those of the alkalis are soluble, and often prescribed in the form of effervescing draughts. The Citrates of Iron, also soluble, have already been mentioned at p. 159. The Citrates of Baryta, Strontian, Lime, Lead, and Silver are insoluble. If the acid is added in excess to Lime-water, no precipitate is observed until it is heated. ʒj. Cit′ will saturate ʒij. of crystal, Carb. Soda.

Tests. Citric acid is apt to be adulterated with Tartaric acid; but the latter is easily detected by any of the soluble salts of Potash.

"It is colourless, almost or entirely destroyed by heat. It is soluble in water and in spirit. What is precipitated from its solution by Acet. Lead is soluble in Nit. Acid. No salt of Potash but the Tartrate causes any precipitate. (This precipitates the Bitartrate.) Added sparingly to cold Lime-water, it does not cloud it. 100 gr. dissolved in water are saturated by 205·7 gr. of Cryst. Carb. Soda." L.

Inc. Alkalis and earths, Carbonates, most Acetates, Tartrate of Potash.

Action. Uses. Refrigerant, Antiscorbutic, Anti-alkaline. Substitute for Lemon Juice; employed for making effervescing draughts.

℈j. of the following Salts will saturate	Lemon Juice, or Sol. Cit′.	Citric Acid.	or Citric Acid ℈j. saturates.
Bicarb. of Potash . .	f ʒiij ß.	gr. 14	29 grs.
Carbonate of Potash .	f ʒiv.	gr. 17	24 grs.
Sesqui-Carb. of Ammonia	f ʒvj.	gr. 24	17 grs.
Carbonate of Soda .	. .	. .	41 grs.
Sesqui-Carbonate of Soda	. .	. .	24 grs.

Syrupus Acidi Citrici, D. A substitute for Syr. Limonum, L. Contains Cit. acid ℥iiß in Oiij. of Syrup, and is flavoured with Tincture of Lemon Peel.

Indian Bael. The bark of the root, and the dried half-ripe fruit, of the *Ægle Marmelos*, Correa, have been lately used as astringents, especially in dysentery, under the above name. They resemble somewhat the analogous parts of the Pomegranate, *q. v.* They should be administered in the same way, and are not unlike them in medicinal properties. The plant is a native of Malabar and Coromandel; it belongs to the nat. ord. Aurantiaceæ. The fruit is roundish, many-celled, with a hard rind. It has been imported by Mr. Pound of Oxford St.

Guttiferæ, *Jussieu*. (Clusiaceæ, *Lindl.*)

The Guttiferæ are found in the tropical parts of Asia and America. Many of the species yield a yellow resinous juice like Gamboge, useful both as a pigment and as a medicine. The fruit of some is edible, the seed oily, and the wood hard and useful as timber.

Cambogia, L. E. D. Gummi-resina. Gamboge. A Gum-resin produced by an uncertain species of Garcinia, L. Gummy-resinous exudation of Hebradendron Cambogioides in Ceylon, and of other uncertain species inhabiting Siam, E. D.

Gamboge is stated by Murray (App. 4, p. 110) to have been first introduced to the notice of Europeans by Clusius, who received it from China in 1603. It is known in India by the name of *ossareh rewund*, or juice of Rhubarb. This substance is mentioned in Persian works on Materia Medica; but we are unable to ascertain when Gamboge came to be substituted for the real Extract of Rhubarb, which Dr. Falconer informs me he obtained in Tibet by the same name. Two kinds of Gamboge, the Siam and the Ceylon, are known in commerce. The former is commonly in cylinders, either solid or hollow. Specimens of both kinds were given to the author by G. Swinton, Esq., when Chief Secretary of the Indian Government, which had been sent to him officially from Bankok, as the produce of Siam. This form is no doubt given by the Gamboge when in a fluid state being run into hollow bamboos, as described by Lt. White. I am indebted to Dr. Peirera for one of these imported a few years since. Kœnig learned from a Catholic priest, who officiated as such to the Christians of Cochin-China, that Gamboge was obtained from the plant by breaking off the leaves and young shoots, and receiving the yellow juice as it issued in drops in suitable vessels, a cocoa-nut or a bamboo; also, that it formed a part of the tribute paid to the king of Siam. It is therefore most probably abundant, perhaps cultivated.

There is every reason to suppose that Siam Gamboge is yielded by some one or more species of Garcinia. But about the name or names of the species there is still much uncertainty. Ceylon Gamboge is produced by a plant which has been referred to a sub-division of the genus *Garcinia*. The *G. Pictoria* of India appears to produce some Gamboge there. And the author once conjectured that Siam Gamboge might be yielded by *G. Cochin-chinensis*, which has been found extensively in Cochin-China, and is described by Rumph. (iii. p. 58) as exuding, when wounded, a yellow viscid juice, which quickly dries up. A guttiferous plant which produces a similar yellow juice, possessing purgative properties, has been forwarded to the author from Rangoon by Dr. Malcolmson.

But Dr. Christison received from Singapore in 1849 specimens of a tree which was cultivated in that colony by Dr. Almeida, and had had been obtained by him direct from the Gamboge district of Siam. This is doubtless the true Gamboge-tree; but it has not yet been

named. It is a diœcious plant, and belongs apparently to *Garcinia* (the Gamboge-bearing section of Wight), being identical in its foliage with *Garcinia elliptica*, Wallich, but differing from that plant in the male flowers and fruit being peduncled.

Siam Gamboge is the kind in general use. On account of the uncertainty with which its origin is surrounded, it is rightly referred by the L. P. to *Garciniæ species incerta.* The name *Stalagmites Cambogioides*, quoted in the L. P. of 1836, was applied to a single specimen, supposed to be the true Gamboge plant, and which is still in the British Museum. This Mr. Brown ascertained to be formed of two plants joined together by sealing-wax, one being *Xanthochymus ovalifolius*, Roxb., and the other *Hebradendron Cambogioides* of Graham.

The Ceylon Gamboge is found in the bazaars of India, but is seldom met with in Europe. Mr. Charles Groves, now of Liverpool, informed me in 1832, that when engaged in the trade of Ceylon, he had sent a considerable quantity of the Gamboge of that island to London; but it was found to be unsaleable, from its inferior quality. Two trees yielding a Gamboge-like substance in Ceylon were first made known by Hermann in 1670: one, Goraka, *Garcinia Cambogia;* and the other, *Kana* (or eatable) *Goraka*, *Garcinia Morella* of later authors, *Stalagmitis* of *Moon's Cat.*, *Hebradendron Cambogioides.* The latter (though it might have been referred to Garcinia with an amended character) was named and described by my friend, Professor Graham* of Edinburgh, from specimens and drawings sent him by Mrs. Col. Walker, who had seen the tree in different parts of the island of Ceylon. Col. Walker writes to Dr. Wight, that it is found in great abundance along the western and eastern coast in the neighbourhood of Battacola, as well as inland, especially in low sandy ground, about Kanderaane, Negombo, and towards Chilau; also 100 miles inland, at so high an elevation as 2000 feet above the sea. Mrs. W. says, the Gamboge is collected by incisions into, or by cutting pieces off the bark about the size of the palm of the hand, early in the morning. The Gamboge oozes out in a semi-liquid state, but hardens on exposure to the air, and is scraped off by collectors next morning. She describes it as brilliant and excellent, and as good for water-colour drawing as any she ever used. Dr. Christison has shown that it has all but an identity of composition with that of Siam; and its medicinal effects were considered precisely the same by Dr. Pitcairn in Ceylon, and by Drs. Graham and Christison in Edinburgh. That procured in Indian bazaars, which is spongy in structure, was not found to be so good as a pigment by the E. I. Company's painters, when under the author's charge; nor did he find it so effective as a purge, in the hospitals at Saharunpore. Dr. Graham ascribes its inferiority, probably with truth, to the want of care in preparing the article for market.

* Since the above was first written, we have had to lament the death of Professor Graham, who was as much loved for his virtues as respected for his character.

The sub-genus Hebradendron has diœcious flowers. ♂ Calyx membranaceous (1) sepals 4 persistent. Petals 4. Stamens (2) monadelphous, column 4-sided, anthers terminal, (3) opening by the circumcision (4) of a flat and umbilicate terminal lid. The inflorescence of the female tree is similar to that of the male. Its flowers white and a little larger, with a germen in miniature of the fruit, and surrounded like it with several (ten?) abortive stamens; crowned by a lobed and muricated sessile stigma. The berry (5) is many or 4-celled, cells one-seeded. Cotyledons fleshy, united. Radicle central, filiform. Trees with entire leaves.

H. (v. *Garcinia*) *cambogioides* (fig. 48) forms a moderate sized tree, with the leaves obovate, elliptical, abruptly subacuminate, the male flowers clustered in the axils of the petioles, on short single flowered peduncles. Sepals yellow on the inside, yellowish white externally. Petals yellowish white, red on the inside near the base. Berry about the size of a cherry (5), round, firm, with a reddish brown external coat, and sweet pulp. Ripe in July.

Besides the above species, there is probably another belonging to the same sub-genus, or to the same group of a larger genus, i. e. *Garcinia*, which yields a very good kind of Gamboge, and one which may prove a good substitute for either the Ceylon or Siam kind,—and that is *Garcinia pictoria*, Roxb. Fl. Ind. ii. p. 627. Dr. Roxburgh says, "I have frequently received samples of the Gamboge the produce of this tree, from my good correspondent, Mr. S. Dyer, the Surgeon at Tellicherry, and I have uniformly found it, even in its crude unrefined

Fig. 48.

state, superior in colour, while recent, to every other kind I have yet tried; but not so permanent as that from China." This, Mr. Dyer, when in London, informed me he could not understand; for he found it excellent as a pigment, and effective as a purgative, and, as far as he remembers, equal to the Gamboge then in common use. Dr.

Christison has obtained some of the "Coorg or Wynaad Gamboge," which he supposes to be the produce of this tree, and confirms Mr. Dyer's statement as to its valuable properties. As Mr. Dyer has favoured me with a full-sized coloured drawing of the foliage and fruit of this species, a woodcut is annexed, for it evidently belongs to the same genus as the above, to which indeed it has been referred with a query by Dr. Graham, and by Dr. Lindley in his Flora Medica, p. 114, where he has reprinted Dr. Roxburgh's description. Good specimens of this Gamboge were sent to the Great Exhibition by Dr. Cleghorn and others.

G. (*v.H.*) *pictoria* (fig. 49) is a tall tree with a pretty thick bark having considerable masses of gamboge on its inside. Leaves with short petioles, oblong ventricose, rather acute, from 3 to 4 inches long by 1½ or 2 broad. Flowers yellow, axillary solitary. Calyx (2) permanent of 2 pairs of concave obtuse sepals. Petals four. Stamens from 10 to 15, with their filaments united into four bodies, which are again united at the base into a narrow ring. "Anthers of the male flower 'peltate,' of the female 2-lobed and seemingly fertile." Germ superior, round, 4-celled, (3) one ovule in each attached to the axis a little above its middle. Stigma 4-lobed, permanent. Berry (1, 2, 2,) size of a large cherry, oval, smooth, very slightly marked with four lobes, crowned with the sessile, 4-lobed verrucose, permanent stigma. Rind leathery, of a reddish colour. Seeds 4, when all ripen (4, 5, 6,) oblong reniform. The filaments in the male flowers are described as

Fig. 49.

being numerous and the anthers peltate. A native of the Malabar and Wynaad jungles, and the Mysore ghauts; also found near Mergui in Tavoy. *G. elliptica*, a native of Silhet, has also been found in Tavoy, and yields a kind of Gamboge.

Dr. Wight, who has paid considerable attention to the characters of the genera and species of the Guttiferæ, has in his Illustrations of Indian Botany, p. 126, referred both of the above species to Garcinia, section Cambogia. Of the last species he says, "Though I consider this a distinct species, I am unable from

an examination of Roxburgh's drawing and description to assign better characters. The difference of the anthers of the female flower affords the best mark, which in the former are, like the male, "peltate," in this 2-lobed and 2-celled (the ordinary structure), and of course thus reduce the value of that character as a generic distinction.

Dr. Christison has ascertained that the Gamboge of Siam is as nearly as possible identical in composition and properties with that of Ceylon. He indeed infers that the plant may possibly have been introduced from Siam with the religion of the Buddhists. It is well known, however, that the Buddhist religion travelled in an opposite direction, that is, from India and Ceylon to Siam, &c.

Prop. (1.) *Siam Gamboge* is usually seen in cylinders (whence it is commonly called *pipe Gamboge*), either solid or hollow in the centre, varying in length, and in thickness from ½ to 2 inches, striated externally, evidently from the impressions of the bamboo mould into which it was run when soft. Sometimes these cylinders are doubled upon themselves, at others stuck together, all generally of fine quality. (2.) *Lump* or *Cake Gamboge* occurs in round cakes or masses, several pounds in weight, most commonly inferior in quality to the former, and often mixed with impurities, as fecula and woody fibre. (3.) *Coarse Gamboge* is formed of the fragments and inferior pieces of the other, which are, however, often mixed with impurities, and not entirely soluble in ether and water. These three kinds come from Siam.

Ceylon Gamboge, though unknown in European commerce, is sometimes seen in irregular masses, often cavernous, or with many sinuous hollows, like the sponge, probably from having oozed out irregularly; the colour a uniform yellow, except on the parts exposed to light, where it is darker; brittle in texture. There seems to be no difficulty in obtaining it in a pure state, and if so, it might become an article of commerce from Ceylon. The pure pieces were found by Dr. C. to be identical in composition and purgative properties with the Gamboge of Siam. The specimen in King's College Museum was given to the Author by the late Dr. Malcolmson.

Gamboge is without odour, and has very little taste; but after a short time a little acridity and uneasiness are experienced in the fauces; and the fine dust, raised in pulverizing it, irritates the nostrils, so as to produce a flow of mucus. It is very brittle. "Fracture somewhat conchoidal, smooth, and glistening: a decoction of its powder, cooled, is not rendered green by Tincture of Iodine, but merely somewhat tawny," E. P., showing the absence of Starch. The colour becomes of a bright gamboge-yellow whenever it is rubbed, "and readily forms an emulsion or paste of the same hue when wetted and rubbed." A portion is dissolved by water, and the remainder forms a perfect emulsion, which is not easily deprived of its colour by filtration. Rectified Spirit dissolves a large portion, Ether about four-fifths, leaving only Gum, which has been called *Arabin*, from being the kind of which Gum Arabic is composed, and which has the composition

$C_{12}H_{11}O_{11}$. The Resin dissolved by the Ether has been called Gambodic acid by Prof. Johnston. Its qualities are said by Buchner to be those of a fatty acid. It may be obtained pure, and of a fine reddish-yellow colour, by distilling off the Ether. It will impart its colour to 10,000 times its weight of Spirit of water. Like other Resins, it is dissolved by solution of Potash (forming Gambodiate or Gambogiate of Potash, of a deep-red colour) as well as by the other caustic alkalis, from which it may again be separated by the addition of an acid. Comp. $C_{40}H_{23}O_8$ (*Johnston*). It also contains a little of a peculiar red-yellow colouring matter soluble in water and Alcohol.

Exposed to heat, it burns with a white flame, emitting much smoke, and leaving a spongy charcoal. In 100 parts of it, Braconnot found 19·5 parts of Gum, 0·5 of impurities, and 80 of a red, insipid, transparent, resinous substance, becoming yellow by pulverization.

The following analysis is by Dr. Christison:

Pipe Gamboge of Siam.		Cake Gamboge of Siam.		Ceylon Gamboge.	
Resin	72·2	Resin	64·8	Resin	75·5
Arabin	23·0	Arabin	20·2	Arabin	18·3
Moisture	4·8	Fecula	5·6	Cerasin	0·7
		Lignin	5·3	Moisture	4·8
		Moisture	4·1		

Tests. The characteristics of good Gamboge have been given above. Iodine will detect Starch. Mechanical impurities can be seen. In external appearance it can only be confounded with the yellow resinous juices of some others of the Guttiferæ; of these that of Garcinia Cambogia, as described by Dr. Christison, is soft, of a pale lemon-yellow colour, and incapable of forming an emulsive paste with the wet finger. That of Xanthochymus pictorius has a pale yellowish-green colour and some translucency, and is not at all emulsive. Also, as observed by Dr. Pereira, it may be confounded with *yellow gum* or rather resin of the Grass-tree, Xanthorræa hastile of New Holland. The presence of Gamboge may be detected by the effects produced by it on water, Alcohol, Ether, and Caustic Potash. The *Gambogiate of Potash* gives, if the alkali be not in excess, with acids a yellow precipitate (*Gambogic acid*), with Acetate of Lead a yellow precipitate (*Gambogiate of Lead*), with Sulphate of Copper, a brown (*Gambogiate of Copper*), and with the Salts of Iron, a dark brown precipitate (*Gambogiate of Iron*). (*p.*)

Action. Uses. Drastic Hydragogue, Purgative, Anthelmintic. Useful in obstinate costiveness, Amenorrhœa, Dropsy. Better given in combination than by itself, as in the following pill, originally introduced by Dr. G. Fordyce, and to which Morison's Pills are similar, though with the objectionable addition of Cream of Tartar.* An

* In the trial of Morison and others *v.* Harmer and Bell, the late Professor Daniell, in analysing twelve of Morison's pills, No. 2, found of Resin of Aloes $5\frac{6}{10}$ grs. Resin of Gamboge $4\frac{1}{10}$ grs. pounded Colocynth 2 grs. Gum $4\frac{7}{10}$ grs. and Cream of Tartar $6\frac{7}{10}$ grs.

alkaline solution has been employed on the continent as a powerful diuretic.

D. gr. ij.—gr. v. in combination with Calomel, Scammony, &c.

Pilula Cambogiæ Composita, L. Pil. Cambogiæ, E. Compound Gamboge Pill.

Prep. L. Mix powdered *Gamboge* ʒij. with powdered *Socrotine* or *Hepatic Aloes* ʒiij. and powdered *Ginger* ʒj. Add *Soft Soap* ℥ß., and beat all together that a mass may be formed. The E. C. orders more Gamboge, and, instead of Soft Soap, Castile Soap and Syrup.

D. gr. v.—℈j.

Canellaceæ, *Martius*.

Canella alba, *Murray*. Cortex, L. Bark, E. D. White Canella. *Dodecandria Monogynia*, Linn.

The name Canella, a diminutive of Canna, was at one time applied to the Cinnamon, whence its French name Canelle. When the present Canella was discovered in South America, it was supposed to be the true Cinnamon, and called by its then name. The earliest full, though not the first, account was given by Monardes (Clus. Exot. p. 323), who

Fig. 50.

states that in 1540 an expedition was sent by Pizarro to examine the province Cumaco, where this Cinnamon was said to be found. It was long confounded with Winter's Bark, and at one time called *Winterania Canella* and *Spurious Winter's Bark*, though both had been clearly distinguished by Sir Hans Sloane in Phil. Trans. 1692. v. Fig. 50.

Canella alba is a tree which is common in many parts of the West

India Islands and in South America, frequently on the sea coasts, where it seldom exceeds twelve or fifteen feet, but in the inland forests it attains a more considerable height. It is propagated chiefly by wild pigeons feeding on its berries. The tree has a straight stem and branched top, and a good deal resembles the Pimento.

The bark is whitish, so that the tree is at once distinguished from others in the woods. The leaves are petiolate, alternate, but not regularly so, obovate, the younger ones pellucido-punctate, the older smooth, shining, of a thick consistence, without nerves, very entire and exstipulate. The flowers are arranged in terminal corymbs, small and of a violet colour, but seldom open. Sepals 3, imbricate, roundish. Petals 5, hypogynous, oblong, twisted in æstivation. Stamens united into a subcylindrical tube (1). Anthers 21, linear, fixed longitudinally on the outside of the tube. Ovary free, but included within the stamen-tube, 3-celled. Style cylindrical. Stigma 2-lobed (2). Berry by abortion 1 or 2-celled; cells 2—3-seeded; seeds one above the other (3), kidney-shaped, beaked, black and shining. Embryo within fleshy albumen in the beak of the seed, curved and roundish; cotyledons linear, radicle above, centripetal.—Sloane, Jam. ii. t. 191, f. 2; Swartz, Lin. Trans. i. vol. viii. p. 102; fructif. Gærtner, i. 373, t. 77.

Prep. The Bark, being the only officinal part, is removed with an iron instrument, and then, being deprived of its epidermis, is dried in the shade. It is in flat or quilled pieces, according to the part of the tree from which it has been removed, the thinner pieces drying into the quill form most readily. (Goebel and K. I. tab. iii. fig. 1—3.) The pieces are of a light buff-colour, paler internally; have an aromatic odour, a warm pungent taste, and are brittle, yielding a yellowish white powder. Boiling water takes up some of this bark, but Alcohol only dissolves its aromatic properties, becoming of a bright yellow colour. Distilled with water it yields a reddish-yellow, fragrant, and very acrid Essential oil, which is often mixed with and sometimes sold for Oil of Cloves. (*Browne.*) Petroz and Robinet also obtained an aromatic Resin, Bitter Extractive, a peculiar Saccharine substance, which will not undergo the vinous fermentation, and which has been called *Canellin*, Albumen, Gum, Starch, Lignin, and Salts. It may be distinguished from Winter's Bark by not being precipitated by Nitrate of Baryta, nor by infusion of Galls,—nor by Sulphate of Iron, as it does not contain Tannin.

Action. Uses. Aromatic Stimulant. Adjunct to tonic and purgative compounds. Used as a spice in the West Indies.

D. gr. x.—ʒß. of the powder.

Off. Prep. Vinum Aloes, L. Tinct. Gentianæ Comp., E. Vinum Gentianæ, E.

The Hippocastaneæ contain *Æsculus Hippocastanum*, or the Horse-chesnut, which being bitter and astringent, was at one time officinal, and employed as a tonic and febrifuge.

The Meliaceæ, a tropical family, distinguished by the filaments of the stamens being united into a tube, contain many plants possessed of medicinal virtues. *Soymida febrifuga*, the *rohuna* of India, at one

time officinal in the E. P., is a powerful East India febrifuge; so also species of *Khaya*, of *Cedrela*, of *Melia*, of *Heynea*, and of other genera, are employed for the same purposes in the countries where they are indigenous.

AMPELIDEÆ, *Kunth.* (VINIFERÆ, *Juss.*) Vineworts.

The Ampelideæ, so called from αμπελος, *ampelos*, a vine, are also sometimes called Vites and Vitaceæ, but these names are too similar to Vitex and to Vitices. They abound in the tropics, chiefly of Asia; a few are found as far north as 30°, and still higher in North America. The species abound in acid, with astringent or coloured juice, which is more or less grateful. The saccharine secretion of the Grape makes it highly esteemed as a fruit.

VITIS VINIFERA, *Linn.* L. E. D. The Grape-vine. Uva; Raisin; the dried or prepared fruit, L. E. The fresh and dried fruits; Grapes and Raisins, D. *Pentand. Monog.* Linn.

The Vine was early cultivated in Egypt, Palestine, and Greece. It is probably a native of Persia. It is found wild about Tinkaboon in Deilum about N. lat. 37°, on the southern shores of the Caspian (Royle *Him.* p. 146). Humboldt also states that it grows wild on the coasts of the Caspian Sea, in Armenia, and in Caramania.

The Vine, like other cultivated plants, varies much in its growth and in the quality of its fruit. It sometimes attains a great size, climbing to the tops of the highest trees in Italy and in Cashmere, and lives to a great age, some vineyards being three or four hundred years old.

The Grape-vine is distinguished among the species of Vitis by having its leaves lobed and sinuato-dentate, naked or tomentose. The calyx is obscurely 5-toothed. The corol composed of 5 petals, cohering at the apex, and like a calyptra splitting at the base and falling off together. Stamens 5. Style wanting. Berry 2-celled, 4-seeded, cells and seeds often abortive. The great diversity in form has been summed up by De Candolle in the following words. The leaves are more or less lobed, smooth, pubescent or downy, flat or curled, pale or deep green. Branches prostrate, climbing or erect, tender or firm. Bunches loose or crowded, ovate or cylindrical; the berries red, greenish or white, watery or fleshy, globose, ovate or oblong, sweet, musky, or austere. Seeds often varying in number, or fruit seedless.

Of the Grape-vine there are numerous varieties cultivated in different countries, as well as in the hot-houses of England. When unripe, the fruit is remarkable for the harsh acidity of its juice, which is then called *verjuice.* It owes this property to a little free Citric, Malic, and Tartaric acids, and to the Supertartrate of Potash. It also contains some Tannin and Extractive, some Sulphates of Potash and of Lime, also Malate and Phosphate of Lime. This juice used to be employed in medicine, and still is used for making syrups and sherbets. Lieut. Burnes mentions that in Caubul they use grape-powder, obtained by drying and powdering the unripe fruit, as a pleasant acid.

Grapes as they ripen lose their acid taste, becoming sweet and delicious in flavour. They are wholesome as fruit, both to the sick nd to those in health; allaying thirst in febrile affections, and being

pleasant nutritious articles of diet. But they are a little acid from containing Citric′ and Malic′, and Supertartrates of Potash and Lime. The sweetness is owing to the formation, at the expense of the acids, of some *Grape-Sugar* or Glucose, which differs from Cane-Sugar in being granular and not presenting crystalline faces, in being less sweet, and less soluble both in water and in Alcohol; differing also in its refractive powers. Composed of $C_{12} H_{12} O_{12} + 2 HO$. When grape-juice undergoes fermentation, this sugar is converted into Alcohol and Carbonic acid. Grape-juice also contains Gum, Extractive, Colouring matter, and a Glutinoid substance of the nature of ferment or yeast. This juice, when expressed, is called MUST (Mustum).

RAISINS. *Uvæ passæ.* Grapes in their dried state are well known as Raisins, and are prepared by being dried in the sun or in ovens, or by steeping them in a weak alkaline ley formed from the ashes of the burnt tendrils. Some are prepared by partially cutting the stalk of the bunches before the grapes are quite ripe, and allowing them to dry upon the vine. They are chiefly prepared in Spain and in the Levant, hence called Valentias and Smyrnas; also in Affghanistan, whence they are taken to India. The best are the Muscatels, from the grape of that name. The Sultanas, like the *Bedanas* of the East, are without stones. The Malaga Raisins are large and fleshy, of a purplish-brown colour. Those of Calabria are similar. The Smyrna Raisins are of a yellowish-brown colour, slight musky odour, less sweet and agreeable than the former. The Corinthian Raisins, or, as they are commonly called, Currants, are produced by a small-sized grape which is abundant in the Ionian Islands.

Raisins differ from Grapes in containing less water and acid, and more Sugar. Besides their dietetical uses, they are demulcent, and are employed for improving the flavour of several officinal compounds (as below), also for demulcent beverages. Though nutritious, they are apt to be indigestible.

Off. Prep. Dec. Hordei Comp., L. Mistura Hordei, E. Dec. Guaiaci, E. Mistura Althææ, E. Tinct. Cardamomi Comp., L. E. Tinct. Quassiæ Comp., E. Tinct. Sennæ Comp., L. E.

The juice of the Grape, expressed and allowed to ferment, yields Wine, Alcohol, and Vinegar. These may be treated of as the products of Fermentation at the end of the Vegetable Materia Medica. The Lees of the Wine, moreover, yield Tartar, that is, impure Cream of Tartar.

Tartar, or impure Supertartrate of Potash, enumerated above as one of the constituents of the juice of the Grape, has already been treated of at p. 95, where it is mentioned that as the Saccharine matter disappears and becomes converted into Alcohol, this salt, being insoluble in the Spirit formed, is deposited in the casks, and well known by the name of *argol* or *tartar*. This is chiefly composed of

Supertartrate of Potash with a little Supertartrate of Lime. Besides its own particular uses (*v.* p. 95), it is important as the salt from which Tartaric acid is obtained.

Acidum Tartaricum, L. E. D. Tartaric Acid.

Tartaric acid, so named from Tartar, is contained in the juice of the Grape, as also in Tamarinds and in some other acidulous fruits. Tartar, which in its purified state is so well known as Cream of Tartar, consists of 1 equivalent of the Bibasic Tartaric acid, in combination with 1 of Potash and 1 of water, thus forming a Supertartrate (*Bitartrate*) of Potash (*v.* p. 95). The chemical process adopted in preparing Tartaric acid is divisible into two stages; in the first of which half the acid of the Cream of Tartar is separated in the form of Tartrate of Lime; and in the second the other half is precipitated, also as Tartrate of Lime.

Prep. E. Boil *Bitartrate of Potash* ℔iv. in *Aq. dest.* Cong. ij. Add gradually *Prepared Chalk* ℥xij. and ʒvij. When effervescence has ceased add *Prepared Chalk* ℥xij. and ʒvij. previously dissolved in *Hydrochloric′* f℥xxvjß. or q. s. and *Aq. dest.* Oiv. (that is, a solution of Chloride of Calcium). Filter and wash the Tartrate of Lime frequently with *Aq. dest.* till it is tasteless. Pour on it *dil. Sulphuric Acid* Ox. and f℥vij. and boil for 15 minutes. Strain. Evaporate with a gentle heat to obtain crystals. Purify by repeated solution, filtration, and crystallization. (It usually requires crystallization 2 or 3 times, and to be purified with animal charcoal, before the crystals can be obtained in a pure state, and free from colour).

This process is thus explained. On the first addition of Chalk, 2 equiv. of the Supertart. Potash (KO, HO, T′) react upon 2 of Carb. Lime (CaO, CO_2). One equiv. of Tartaric′ unites with 2 KO, forming the neutral bibasic Tartrate of Potash, which is dissolved; the other combines with the 2 Ca O, to form a similar neutral Tartrate of Lime, which, being insoluble, is precipitated. The Carb. acid of the Chalk escapes with effervescence.

$$2\,(KO, T, HO) + 2\,(CaO, CO_2) = 2\,KO, T + 2\,CaO, T + (2\,CO_2 + 2\,HO).$$

In the second place, Chloride of Calcium is added in solution, and 2 equiv. of this salt react on the 1 equiv. of Tart. Potash (2 KO, T) which remains dissolved. 2 K unite with 2 Cl to form 2 eq. of Chloride of Potassium, which are dissolved; while the 2 O of the Potash join the 2 Ca to form Lime,—the 2 eq. of which combine with the Tart′. to form a second portion of Tart. Lime, which again precipitates.

$$2\,KO, T + 2\,CaCl = 2\,KCl + 2\,CaO, T.$$

The Tartrate of Lime, being separated, is decomposed by Sulph. acid. An insoluble Sulphate of Lime is formed, the whole of the Tartaric acid remaining alone in solution.*

* When Tartaric acid is made on the large scale, the materials for its preparation, Water, Tartar, and Whiting, are mixed in a large vat or generator, the contents of which are heated by steam, and kept in motion by an iron stirrer. The Carb. acid gas is carried off by a pipe above, and employed in the preparation of Bicarb. Soda (q. v.). In the second stage of the process, Sulphate of Lime, which is cheap, is generally used instead of the Chlor. Calcium. The heat and agitation being renewed, the decomposition is the same as above, only that Sulph. Potash is obtained in solution, and subsequently employed for various purposes. When the Tart. Lime is decomposed by Sulph. acid, Sulph. Lime is again obtained, and again employed as before. (P. J. x. 398).

Tartaric acid, discovered in 1770 by Scheele, is colourless, without smell, and pleasantly sour. Its crystals are large, clear, and more or less modified from their primary form, the oblique rhombic prism. They are permanent in the air, soluble in five or six times their weight of water at 60°, and in twice their weight at 212°; less so in Alcohol. The solution decomposes in keeping, a light and thin membranous-like matter being formed. The effects of heat, of acids, &c. are remarkable in producing a number of new compounds. When heated to about 400° it melts, loses one-fourth of its water, becomes deliquescent, and forms what has been called Tartralic′. A further degree of heat produces Tartrelic′, an anhydrous Tartaric′, which is insoluble and powdery. When subjected to destructive distillation, Carbonic acid and water are given off, and two pyrogenous acids are produced. One of these, the Pyrotartaric, is oily, and the other crystalline. A solution of Tar′ added to solutions of the earthy salts, will form white precipitates, as of Lime, Strontia, and Baryta, soluble in excess of acid. With the Acetate of Lead and Nitrate of Silver it also forms white Tartrates of these metals. It is most easily distinguished from other acids by a soluble salt of Potash, with which on addition it precipitates a Supertartrate of Potash, either as a powder or in crystals, according to the state of dilution. It is a Bibasic acid, and remarkable for forming double salts, of which the Tartrates of Potash and Soda, of Potash and Antimony, of Potash and Iron, are officinal. Comp. $C_8\,H_4\,O_{10}$ $+2$ Aq. (*Liebig.*) *

Tests. Tar′ is apt to be adulterated with Bitartrate of Potash or with Lime. The following are the tests mentioned by the L. C., which gives no formula for preparing the acid. It is colourless. Almost or entirely destroyed by heat. Soluble in water. The solution precipitates the Bitartrate from any neutral salt of Potash: (Citric acid does not). Nothing is precipitated from it by Chlor. Barium (test for Sulphates); that which is thrown down by Acetate of Lead, is redissolved by Nitric acid. 100 gr. dissolved in water are saturated by 192 gr. of cryst. Carbonate of Soda. "When incinerated with the aid of red oxide of Mercury, it leaves no residuum, or a mere trace only," (E.) showing the absence of Lime or of any fixed impurity.

Inc. Alkalis, Earths, and their Carbonates; salts of Potash, of Lime, and of Lead; Nitrate of Silver.

Action. Uses. Refrigerant. Being cheaper, it is often used as a substitute for Citric acid, especially in making effervescing draughts, its saturating power being nearly the same. The common Soda Powders are made with Tar′ gr. xxv. and Bicarb. Soda ℨß. kept in separate powders, dissolved in water, and mixed at the time of being

* According to M. Bouchardat, Tartaric acid resembles Sugar in giving off an odour of Caramel when thrown on burning coals, in emitting an electric light when pounded in a mortar in the dark, and in being able to rotate the plane of vibration of polarized light. Neither of the last two properties is possessed by Citric acid. (P. J. ix. 72).

taken in a state of effervescence. So also the gentle aperient Seidlitz Powders are formed with Tartrate of Potash and Soda ʒij., Bicarb. of Soda ℈ij. dissolved in water and taken in effervesence with Tartaric acid ʒß.

OXALIDEÆ, *Dec.* Oxalids.

The Oxalideæ abound in tropical America and at the Cape of Good Hope. A few, and those most widely diffused, are found in temperate and warm parts of the world. Averrhoa in India and the Indian Islands. The herbaceous parts of many of the species, and the fruits of others, are acidulous from the presence of Binoxalate of Potash. The tubers of the stemless species abound in fecula and are esculent.

OXALIS ACETOSELLA, *Linn.* Wood-Sorrel. *Decand Pentagyn.*

This elegant little plant is found throughout Europe in shady situations. It is distinctly noticed from the time of Charlemagne, and is supposed to have been known to the Alexandrian school. Mr. Bicheno considers it to be the true Shamrock. It is not now officinal.

It obtained its ancient name of Oxys (*Pliny*) from ὀξυς, *acid taste.* It is, like the common sorrel, of an agreeably acid taste, but harsh to the teeth when chewed, owing to the presence of Binoxalate of Potash, which is secreted by this and several other plants, as by *Rumex acetosa*, the species of *Rheum*, and especially by *Cicer Arietinum.* It is refrigerant and antiscorbutic.

ACIDUM OXALICUM. Oxalic Acid. *Acid of Sugar.*

Oxalic acid ($C_2\,O_3, HO + 2$ Aq. $= 63$ when crystallized) has obtained its name from the foregoing plant. It is said to be contained in a free state in Cicer Arietinum, but is probably in the state of Binoxalate. It is acid and powerful enough to blanch the boots in walking through a field of the plant. Some Lichens contain a very large proportion of Oxalate of Lime. It is now obtained in the largest quantities from the action of Nitric acid on several substances of the nature of Sugar and Starch, including these substances themselves. Hence it has been called Acid of Sugar. The Nitric′ becoming decomposed, these substances lose their Hydrogen, become oxidized, and converted into an acid, which is found to be composed of 2 Eq. of Carbon united with 3 of Oxygen. This is soluble in about its own weight of hot, and in about 8 times its weight of cold water, the solution being intensely acid. It readily crystallizes in quadrangular crystals, which are colourless and transparent, elongated, six-sided, and flattened, with two or four terminal planes, being derived from an oblique rhombic prism. The crystals effloresce in a dry atmosphere, and melt in their water of crystallization, are volatilized by heat, decomposed at a higher temperature, and with the acid of Sul′, into water, Carb′, and Carbonic oxide. Their acidity is powerful, acrid, and cor-

rosive: hence the acid is a virulent poison. Numerous fatal cases have occurred from the resemblance of its crystals to those of Epsom Salts. But they may readily be distinguished by their crackling noise when dissolving in water; by the intensely acid taste and reaction of the solution; by its effervescing with the alkaline Carbonates, which give a white precipitate with Epsom Salts or Sulphate of Magnesia (p. 131). This is moreover distinguished by its nauseously bitter taste. The crystals of Ox′ also resemble those of Sulphate of Zinc (p. 166). Oxalic′ is distinguished by its powerful affinity for Lime, separating it even from Sulphuric′. The Oxalate of Lime formed is insoluble in an excess of acid. A soluble Oxalate will be detected by the solution of a neutral salt of Lime or of Oxide of Lead. The acid may be separated from the Lead by the action of Sulphuretted Hydrogen; and then being filtered and evaporated, it will crystallize. Insoluble Oxalates, the bases of which form insoluble compounds with Sul′, may be decomposed by the action of this acid, when the Ox′ will be separated.

Action. Uses. A virulent Poison, which is very speedy in its action. Acute pain is immediately experienced, followed by vomiting. Great depression of the circulation ensues, nervous symptoms, such as great debility, numbness, &c., sometimes followed by convulsions. "But death follows so speedily after the injection of large doses,—few of those who have died survived above an hour,—that the symptoms have not been fully made out." (*c.*) Irritation and corrosion of the stomach are observed.

Antidotes. Chalk, Whiting, or Magnesia mixed up with water should be administered as quickly as possible in large quantities. Evacuate the stomach. Large quantities of water may be also useful.

Binoxalate of Potash ($KO, 2\,C_2\,O_3 + 2$ Aq.$=138$), the salt which is contained in Wood-Sorrel and other plants, is often called *Salt of Sorrel* or *of Wood-Sorrel*, and very absurdly *Essential Salt of Lemons.* It may be obtained from the juice of the plant by evaporating and then redissolving, and subsequently crystallizing; or by neutrallizing a portion of Oxalic acid with Carb. of Potash, and then adding an equal quantity of Ox′, when the salt is obtained in colourless rhombic prisms, having a sour taste, and requiring 40 parts of water for their solution. This salt may be used for the same purposes as the plant itself; but in large doses will act as a poison.

Quadroxalate of Potash ($K\,O, 4\,C_2\,O_3 + 7$ Aq. $= 255$) is usually sold in the shops for the above salt, being much used for removing iron-moulds and ink-stains. It may be made by a process similar to that just mentioned, but adding 3 more parts of Oxalic′ to the Oxalate.

AMMONIÆ OXALAS, L, (*appendix*). E. Oxalate of Ammonia. Dissolve *Carb. Ammonia* ℥viij. in *Aq. dest.* Oiv., and add *Oxalic′* ℥iv.

Boil and evaporate, that crystals may form. Used only as a test. It is employed by the L. C. as a test for the presence of Lime in Aqua Destillata. (*v*. p. 74.)

ZYGOPHYLLEÆ, *R. Brown*. Beancapers.

They abound in warm extratropical parts of the world. Some of the species of Guaiacum have their bark and wood abounding in resin, possessed of stimulant properties. Others of the species have a disagreeable odour.

GUAIACUM OFFICINALE, *Linn*. Guaiaci Lignum, the wood, L. E. D. Guaiacum: resina, L. E. D. Resin obtained by heat from the wood. Officinal Guaiacum tree. *Decandria Monog*. Linn.

Guaiacum was made known in Europe by the Spaniards, about the year 1508 (*Monardes*, c. xx.), having been previously employed in medicine by the natives of the West Indies and of South America, where the species are indigenous, and called *Guayacan*.

Fig. 51.

The officinal Guaiacum (fig. 51) is a large evergreen tree, from 40 to 60 feet in height, with deep penetrating roots and of a dark gloomy aspect. The wood is hard, heavy, of a greenish colour, and remarkable for the direction of its fibres, being cross grained; the strata running obliquely into one another in the form of an ✕, (Browne, 1789,) or obliquely at an angle of 30° with the axis. The leaves are opposite, abruptly pinnate, with 2 sometimes 3 or 4 pair of leaflets, these are smooth, obovate, or oval obtuse, delicately veined. The flowers are borne on long single-flowered peduncles, 8 or 10 generally rising together from the axils of the upper pairs of leaves. The calyx is 5-partite, segments obtuse, a little velvetty. Petals, 5, oblong, spreading, of a light blue colour. Stamens

10 (fig. 1,) with their filaments a little broader towards the base. Style and stigma simple. The fruit is a fleshy capsule of a reddish yellow colour, slightly pedicelled, almost truncate at the apex, 5-angled, 5-celled (fig. 3), or from abortion 2—3-celled. Seeds solitary in each cell, pendulous from the axis (fig. 2), radicle superior, cotyledons somewhat fleshy. Albumen cartilaginous. A native of the West India Islands, particularly Cuba, St. Domingo, and the south side of Jamaica, flowering in April and ripening its seed in June.—*Sloane* Hist. t. 222, f. 3. Bot. Reg. New Ser. xii. t. 91.

G. sanctum, Linn., a native of Porto Rico, and *G. arboreum*, Humboldt and Bonpland, *Guayacan* of the natives of Cumana and Carthagena, are said to yield some of the Guaiacum-wood, or Lignum Vitæ of commerce, which is also obtained from the Isthmus of Darien.

Guaiaci Lignum, L. E. D. Guaiacum Wood. Known in commerce by the name of Lignum Vitæ, is imported in great logs generally without, but sometimes covered with, a smooth grey bark, from Jamaica, Cuba, St. Domingo, &c. It is remarkable for its weight (Sp. Gr. 1·33), hardness, and toughness, and is therefore much used in machinery, also for rollers, pestles and mortars, &c. It is distinguished by its cross-fibre (*v. supra*), and is surrounded with the alburnum or *sap-wood*, which is smooth, hard, and yellow, like box ; while the *heart-wood* is of a dull brownish-green colour, from containing a large proportion of Guaiac. It is usually met with in shops in the form of shavings and turnings, which are, however, apt to be intermixed with those of other woods, as of box. The sawdust of Guaiacum is stated by Richard to become green by exposure to the air. It is turned to a bluish-green by the action of Nitric′ or its fumes. But the cross-fibre should also be looked for.

The Bark, which is of a dark greenish colour with greyish spots, has sometimes been used officinally. It is acrid in taste, and has been thought by some to be as efficacious as the wood.

The wood is without smell, except when rubbed or heated; it has a slightly bitter and pungent taste, chiefly affecting the throat. It burns readily, even when the corner of a block is presented to a flame. It yields its virtues partially to water, a decoction becoming yellow in colour and acrid in taste. Geiger, from lbj. of the wood, obtained ℥ij. of an aqueous extract. Hagen obtained 3 per cent. of Guaiacum from the wood. It contains both an acrid principle and Guaiacum. "The former abounds most in the alburnum, the latter in the central wood : the more acrid alburnum ought perhaps to be preferred." (*c.*)

Brown states that all parts of the plant are possessed of active properties, the fresh bark being aperient and a purifier of the blood; the pulp of the berries emetic and cathartic ; the leaves detergent, and employed in cleaning house-floors, and for washing linen.

Guaiaci Resina. Guaiacum. Resin of Guaiacum, or Guaiac, (*Gum Guaiacum*), is the concrete juice of the tree, and is usually thought to be the only active part, even of the wood. According to Browne, it transudes frequently of its own accord, and may thus be

seen concreted on the bark at all seasons of the year, but in greater abundance when the bark has been cut or wounded. It is also obtained by heating in the fire billets of the wood which have been bored longitudinally, and receiving in a calabash the melted Guaiac at the other end. A third way of preparing it is by boiling the chips in salt and water, and skimming off the Guaiac, which rises to the surface.

Guaiac may be seen in grains, sometimes agglutinated, but usually in homogeneous lumps. Sp. Gr. 1·2—1·23; but sometimes mixed with pieces of the wood and bark; of a brownish-green colour, sometimes with a tinge of red; fracture brilliantly shining, glass-like, and resinous; brittle; powder at first of a greyish colour, but generally becoming green when exposed to light. It softens in the mouth: the taste, at first scarcely perceptible, is slightly bitter; but becoming acrid, it produces burning in the fauces. The odour is slight, increased on pounding, or on heating it, when it melts and evolves a balsamic odour. Water has but moderate action on it, dissolving about 9 per cent., chiefly Extractive. (*v.* Extract, *infra.*) The fixed and volatile oils scarcely act upon it. Alcohol dissolves 91 per cent. of the resinous substance called Guaiac, becoming of a deep brown colour. The Guaiac is precipitated on the addition of water, S′ and H Cl′. Ether also dissolves the resin. This resin has the nature of an acid; it is called *Guaiacic acid*, and forms soluble salts with alkalies. Solutions of Potash and Soda dissolve it freely, as does Ammoniated Alcohol. Sul′ becomes of a rich claret colour; Chlorine produces remarkable changes of colour in the Tincture, from green to blue, and from that to brown, finally converting Guaiac into Oxalic acid. Nitric acid does the same. The changes of colour seem, as above, to be dependent on the absorption of Oxygen.

Dr. Schmidt makes use of this property as a test to ascertain the presence of Guaiacum as an adulteration in the resins of Scammony and Jalap. If an alkaline solution of one of these be added to a solution of Hypochlorite of soda, it is said to assume a green colour if only $\frac{1}{320}$th part of Guaiacum be present. (P. J. xi. 523.)

The Tincture imparts a blue colour to Gluten, and to substances containing it; also to mucilage of Gum Arabic made with cold water, and to transverse sections of various roots: hence the E. C. employ slices of the Potato as a test of its purity. The colour is produced most near the eyes and about the skin of this tuber, at which parts the Gluten, or Albuminous matter, abounds. Mere Starch will not produce it.

Guaiac consists evidently of an extractive-like matter, which is taken up by water, and of the acid Resin, which, having peculiar characters, is called Guaiacic acid. But Unverdorben considers this to be composed of 2 Resins; one is soluble in Ammonia, and the other, which forms the largest portion of Guaiac, merely mixes with it. M. Thierry has by means of Ether separated from the watery extract of

Guaiacum what he calls Balsamic Resin, and from it obtained an acid which he calls Guaiacic acid, and which resembles Benzoic and Cinnamic acids, but differs from them in being perfectly soluble in water. Besides the Balsamic Resin, the extract he states contains another resin, which is soluble in Ammonia.

Dr. Ure, in an ultimate analysis of Guaiacum, found it composed of Carbon 67·88, Hydrogen 7·05, Oxygen 25·07=100. Prof. Johnston considers the composition of the resin to be $C_{40}H_{23}O_{10}$ and its Eq. 343.

Tests. "Fresh fracture red, slowly passing to green: the tincture slowly strikes a lively blue colour on the inner surface of a thin paring of a raw potato." E. P.

Action. Uses. Acrid Stimulant and Alterative, Diaphoretic. In large doses, irritant of the intestinal canal. Useful in chronic Rheumatism, Secondary Syphilis, Scrofula, and in chronic Skin Diseases.

D. gr. x.—ʒß. in powder or bolus, or in the following mixture.

MISTURA GUAIACI, L. E. Guaiacum Mixture.

Prep. L. Triturate *Resin of Guiacum* ʒiij. with *Sugar* ℥ß. and powdered *Gum Arabic* ʒij., lastly add gradually *Cinnamon Water* Oj., constantly rubbing up. E. Similar.

An emulsion is formed with the aid of the Sugar and Gum, in which all the constituents of the Guaiacum are suspended. It may be given in doses of f℥ß to f℥ij. two or three times a day.

DECOCTUM GUAIACI (*Ligni*), E.

Prep. Boil *Guaic turnings* ℥iij. and *Raisins* ℥ij. gently in *Aq.* Oviij. till reduced to Ov., towards the end adding *Sassafras rasped* ℥j. and *Liquorice Root bruised* ℥j. Strain the liquor.

As water takes up only a small portion of Guaiacum, this would be a very inert preparation, were it not that the acrid extractive of the wood is one of the parts dissolved; and this therefore may prove a useful form in some cases. It is like the old *Decoction of the Woods*, and to which the *Dec. Sarzæ Comp.* L. also is very similar. Prescribed in doses of f℥ij.–f℥iv. it is useful in producing a diaphoretic effect in cases of chronic Rheumatism, &c., the patient being kept warm to favour the determination to the skin.

An *Extract of Guiacum* is ordered in the French Codex, in which the *wood* is thrice boiled in *Aq. Dest.*; this allowed to stand for 12 hours to deposit, decanted, and evaporated to a soft consistence, the deposit being then mixed, and about a ⅛th part of Alcohol added towards the end of the process.

TINCTURA GUAIACI, E. D. Tincture of Guaiacum.

Prep. E. Digest for 7 days *Resin of Guaiacum* bruised ℥vij. in *Rectified Spirit* Oij. Then filter. D. Similar.

Action. Uses. Rectified Spirit being a good solvent of Guaiacum, this is a good form for exhibition in chronic Rheumatism, &c., in doses of f℥j. to f℥iv. with milk or mucilage.

TINCTURA GUAIACI COMPOSITA, L. Tinct. Guaiaci Ammoniata, E. Compound or Ammoniated Tincture of Guaiacum.

Prep. L. Macerate for 7 days *Resin of Guaiacum* bruised ℥vij. in *Aromatic Spirit of Ammonia* Oij. Then filter. E. Spirit of Ammonia, E. is used.

Action. Uses. Ammoniated Alcohol being an excellent solvent for Guaiacum, this Tincture has been much employed in chronic Rheumatism, &c., and is considered more efficacious than the other; but requires, like it, to be given in some viscid fluid.

Officinal Preparations containing Guaiacum. Resin. Pil. Hydrargyri Chloridi Comp. L. E. D. (p. 209.) Pulvis Aloes Compositus, L. *Wood.* Decoctum Sarsæ Comp. L.

RUTEÆ, *Adr. Juss.* Rueworts.

The Ruteæ are inhabitants chiefly of the temperate parts of the Northern Hemisphere. They secrete a volatile oil with bitter matter.

RUTA, L. E. Folia, L. Leaves and unripe Fruit, E. Ruta graveolens, *Linn.* Common or Garden Rue. *Decand. Monog.* Linn.

The common Rue, and *Ruta angustifolia*, both natives of the South of Europe, were much employed and highly esteemed by the ancients, as they still are by Asiatic nations.

R. graveolens is a small branching under-shrub about 2—3 feet high. Stems straight, slightly striated, of a dull greenish colour. Leaves of a glaucous green, supra-decompound, leaflets thickish, dotted, oval oblong, tapering towards their bases, the terminal one obovate. Flowers in a terminal corymb. Calyx small, 4-fid, rarely 5-fid. Petals 4, in the upper flowers 5, yellow, oval, unguiculate, entire or denticulated, with their apices curved inwards. Stamens 8 or 10. Ovary marked with 2 crucial furrows. Capsule globular, warty in 4 or 5 obtuse lobes, each separable into two valves. Seeds dotted.

Every part of the Rue is distinguished by a strong and repulsive odour and an acrid and bitter disagreeable taste. The leaves have the strongest odour when the seed-vessels are well developed, but still green. A great portion of their peculiar characters is necessarily lost in drying. "The E. C. correctly adds the unripe fruit, because the seed-vessel is covered with large oil-vesicles, which impart great activity to this organ." (*c*).

Action. Uses. Rubefacient, Stimulant, Antispasmodic, Emmenagogue, Anthelmintic.

RUTÆ OLEUM, L. E. Oil of Rue; distilled from the flowering herb.

Distilled with water from the herb, flowers, and half-ripe ovaries of

common Rue. It is of a light yellow colour, acrid in nature, and with a very disagreeable smell.

Action. Uses. Stimulant, &c. Used as an Antispasmodic and Emmenagogue.

D. ♏ij.—♏v. rubbed up with Sugar and water.

CONFECTIO RUTÆ, L. Confection of Rue.

Prep. Rub together into a very fine powder *freshly bruised Rue, Carraway, Bay Berries,* āā ℥iß. with *Black Pepper* ℨij.; then let *prepared Sagapenum* ℥ß. and *Honey* (despumated) ℥xvj. liquify over a slow fire with *Dist. water* q. s.; add the powder gradually to it, and mix all together.

The dried herb is less efficacious than when fresh. The Rue being combined with substances having similar properties, this confection is sometimes useful in flatulent colic in doses of ℈j.—ʒj.

The *Syrup of Rue*, though not officinal, is kept by most druggists. It is made by dissolving *Oil of Rue* ♏xij. in *Rectified Spirit*, ʒiv. and then mixing with *Simple Syrup* O

D. Often given by nurses, in doses of ½ to 2 tea-spoonfuls, in the flatulent colic of children.

DIOSMEÆ, *Adr. Jussieu.* Diosmads.

The *Diosmeæ* are closely allied to Zanthoxyleæ, and also to Ruteæ, with which they are indeed usually united, and are to be distinguished from them chiefly by the endocarp in the ripe capsule. They are found in South Africa and in New Holland, some in tropical America, and a few in equinoctial Asia, with only Dictamnus in the North of Asia and the South of Europe. They secrete volatile oil and Resin, as well as a bitter principle.

BUCHU, L. E. D. Folia. The leaves of Barosma serratifolia, *Willd.*, B. crenulata, *Willd.*, and B. crenata, *Eckl.* L. Bucku, E. *Diosma. Pentandria Monogynia*, Linn.

The leaves of one or more plants called *Buchu*, *Bucku*, or *Bookoo*, having been found by Mr. Burchell, the African traveller, to be employed by the Hottentots as a vulnerary and in the treatment of diseases of the urinary organs, became known in this country about the year 1823. Bucku was first introduced into the D. P., and then into the L. P. as the leaves of *Diosma crenata.* Sir W. Hooker, however, showed in the Bot. Mag. t. 3413, that the leaves of *D. crenulata* are the most common, and that those of *D. serratifolia* are also found in commerce. All these species have since been restored to the genus BAROSMA, to which they originally belonged. "Several species are collected by the Hottentots, according to Thunberg, especially *B. betulina* and *pulchella*, and even *Adenandra uniflora*, to which some *Agathosmas* and many others may no doubt be added." (*Lindley*, Fl. Med.) These are all included in the genus Diosma by De Candolle (Prod. i. p. 713).

Fig. 52.

Barosma.

Calyx 5-fid or 5-partite. (1.) Petals 5, inserted into the base of the disk, which lines the bottom of the calyx and has a short, scarcely prominent rim. Stamens 10, inserted with the petals and equal to them in length, 5 fertile alternating with the petals, filaments filiform, subulate, with the anthers commonly terminated by a small gland, often becoming recurved, 5 opposite to and shorter than the petals, sterile, petaloid, indistinctly glandular at the apex. Ovaries 5, united into one, 5-lobed and auriculate at the apex, commonly with a glandular tubercle. Style longer than the stamens. Stigma minutely 5-lobed. (2.) Fruit (3) composed of 5 compressed cocci, outwardly auriculate and covered with glandular dots. Seed (4) oblong.—Shrubs of the Cape of Good Hope. Leaves opposite or alternate, leathery, flat, dotted (5), especially near the margin, varying in shape. Flowers axillary, on single or 3-flowered peduncles, or fasciculate in single flowered peduncles.

B. crenata. Fig. 52. (*Diosma crenata,* Dec.) Leaves ovate and obovate, acute, serrated, dotted glandular at the margin. Flowers pink, solitary and terminal, on somewhat leafy pedicels.—Loddiges, Bot. Cab. t. 404.

B. serratifolia. (D. serratifolia, Dec. and Bot. Cab. t. 378.) Leaves linear-lanceolate, serrulate, smooth, dotted, glandular at the edges, three-nerved. Flowers white, on solitary lateral pedicels, bearing two leaflets above the middle.

B. crenulata, Willd. Hooker, B. M. t. 3413. (*D. crenulata,* Linn. *D. odorata,* Dec.) Leaves decussate, ovate, oblong, on very short petioles, very obtuse, minutely crenated, quite smooth and of a darkish green above, beneath paler, with a few obscure oblique nerves, dotted with oil vesicles, with at every crenature a conspicuous pellucid gland and a pellucid margin round the whole leaf. Peduncles axillary and terminal chiefly from the axils of the superior leaves, single-flowered, often bearing a pair of small opposite leaves or bracts above the middle. Beneath the calyx are 2 or 3 pairs of small imbricated bracts.

Buchu leaves are smooth, leathery, and shining, serrate or crenate at their margins, studded with dots, *i.e.* vesicles filled with essential

oil, of a light yellowish-green colour, of a strong, considered by some a disagreeable, odour; the taste warm and aromatic. They necessarily vary in form according to the species of plant from which they have been obtained. Those which are ovate or obovate are yielded by *B. crenata*, the linear-lanceolate ones by *B. serrulata*, and those which are ovate, oblong, and obtuse, by *B. crenulata*. All may be found intermixed among the Buchu leaves of commerce. They contain Volatile Oil, which is of a yellowish-brown colour and a penetrating odour, Bitter Extractive (*Diosmin*), Resin, Gum, Lignin, &c.

Action. Uses. Stimulant and Tonic in chronic affections of the Urinary organs attended with increased secretion of Mucus, in doses of the powder ℈j. or ʒß.

INFUSUM BUCHU, L. E. D. Infusion of Buchu.

Prep. L. Macerate for 4 hours in a covered vessel *Bucku leaves* ℥j. in boiling *Aq. dest.* Oj. Strain.

Action. Uses. Tonic and Diuretic in doses of f℥iß. two or three times a day.

TINCTURA BUCKU, E. Tinct. Buchu, D. Tincture of Bucku.

Prep. E. Digest for 7 days *Bucku* ℥v, in *Proof Spirit* Oij. Pour off the clear liquor. Filter. This tincture may also be made by percolation. D. Similar.

Proof Spirit is a good solvent for the active principles of Bucku. *D.* fʒj.—fʒiv.

CUSPARIA, L. E. Cortex. Galipea officinalis, *Hancock*, E. G. Cusparia, *St. Hilaire*, L. Cusparia Bark. Angustura.

Cusparia or Angustura Bark was introduced into England about the year 1788. It was subsequently ascertained that it was imported from Angustura on the Oronoco. Humboldt and Bonpland in their travels in South America, having ascertained that the bark was called *Cusparé* by the natives, called the tree which they supposed yielded it *Cusparia febrifuga;* but having sent home specimens to Willdenow, he named it *Bonplandia*, in compliment to one of the travellers, and *trifoliata* from the number of its leaflets. Aug. St. Hilaire having ascertained that, instead of being a new genus, it was only a new species of an old genus, GALIPEA, named the tree *G. Cusparia*, which it still retains. Dr. Hancock, however, who resided for some months in 1816 in the district where the Cusparia is produced, states that the above travellers did not themselves see the tree, but got branches of it without flowers from an Indian; that they afterwards thought they recognized the same plant, which they found growing in considerable forests. This Dr. H. considers to be a distinct species of the same genus as the plant which yields Cusparia, and which he calls *Galipea officinalis*.

GALIPEA, *Aublet.* Pentand. Monog. *Linn.*

Calyx cup-shaped, 5-toothed, often 5-angled. Petals 5, united below into a tube, which is often pentangular. Stamens 5, rarely 6, 7, 8, or 4, with filaments adhering to the tube of the corolla, rarely all fertile, usually 2—4 with abortive anthers. Ovaries 5, connected, 1-celled, supported by an urceolar disk. Styles 5, distinct or connected at the base, each terminated by an obtuse pentangular stigma. Capsules by abortion 1 or 2.—Shrubs or trees. Leaves simple and ternate. Natives of Tropical America.

G. OFFICINALIS, *Hancock*, E. A tree from 15 to 20 feet high, with smooth bark. Leaves alternate trifoliate, petiole about the length of the leaflets, which are oval, but tapering towards both the base and apex, from 6 to 10 inches long, smooth, shining, when bruised smelling like tobacco. Panicles cylindrical, contracted, stalked, longer than the leaves, with the branches about 3-flowered. Calyx hairy. Petals white, downy, 2 longer than the others. Stamens 7, of which only 2 are fertile. Carpels villous as they ripen, 2-seeded, one usually abortive. —Neighbourhood of the Oronoco, between 7° and 8° N. lat. *Orayuri* of the natives, yields *Carony*, that is *Cusparia bark*, exported from Angustura.

G. CUSPARIA, (*S. Hilaire*), L. A forest tree, from 60 to 80 feet high, with fasciculate pubescence. Leaves alternate, trifoliate, long-stalked, leaflets sessile, unequal, ovate, lanceolate, acute, gratefully fragrant, with scattered glandular and pellucid dots. Flowers in axillary racemes, which are almost terminal. Calyx and corolla white with fascicles of hairs, seated on glandular bodies on the outside. Stamens 6, only 2 fertile. Anthers with two short appendages. Seed solitary.—Forests of tropical America, between Cumana and New Barcelona; yields Cusparia or Angostura bark (Cusparé of the natives) according to Humboldt and Bonpland.

Cusparia or Angustura Bark is in pieces some inches in length, from half to two inches in breadth, and only one or two lines in thickness, more or less quilled, sometimes almost flat. It is covered with a thin, yellowish-white, mealy epidermis, smooth or wrinkled; the inner surface is rather smooth, but separable into splinters of a dull brownish colour; the substance of the bark is compact, and of a dark cinnamon-colour. It is brittle, fracture short and resinous ; powder of a greyish-yellow colour. The odour is strong and peculiar, the taste bitter, permanent, but slightly aromatic. It yields its properties to water and to Proof Spirit. Its properties depend on the presence of Gum, Resin, Volatile Oil, and a peculiar bitter principle. The Resin is a little acrid, as is also the Volatile Oil, which has the peculiar odour of Cusparia Bark. The Bitter principle or Extractive has also been named *Angusturin* and *Cusparin*, being a neutral principle, crystallizable in tetrahedrons, easily fusible, soluble in Rectified Spirit, in acids, and in alkaline solutions, precipitated of a whitish colour by Tincture of Galls, sparingly soluble in water, insoluble in Ether and the volatile oils, bitter in taste, and a little acrid.

Tests. Cusparia Bark may easily be distinguished from other officinal barks, and is now seldom liable to adulteration. The E. C. indicates the purity by stating that "its outer surface is not turned dark green, nor its transverse fracture red by Nit'." Some years since, several cases of poisoning occurred on the Continent from the substitution of what has been called *False Angustura Bark*, but which has been

ascertained to be that of the *Strychnos Nux Vomica* (q. v.), and which Dr. Neligan, at a later period, obtained as Angustura Bark at a druggist's in Dublin. The pieces of this are usually much thicker than Cusparia Bark, harder, more compact, covered with a ferruginous efflorescence, sometimes yellowish-grey, and marked with prominent white spots, without any aromatic odour, and having an intensely bitter taste. The transverse section, as indicated in the E. P., becomes bright red when touched with Nit′, in consequence of this acting on the *Brucia* in the bark; and also the rusty spots on the epidermis turn to a dark green when in contact with the same acid.

Action. Uses. Stimulant Tonic, Febrifuge, Antidysenteric.

D. Powder, gr. x.—℈ß. Extract, gr. v.—gr. xv.

INFUSUM CUSPARIÆ, L. Inf. Angusturæ, E. Infusion of Cusparia.

Prep. Macerate for 2 hours in a covered vessel *bruised Cusparia* ℨv. in boiling *Aq. dest.* Oj. Strain.

A stimulant and tonic in low states, in doses of f℥iß. It is of a dull orange-colour. Sesquichloride or Sulphate of Iron produces in it a dark greyish precipitate. Tincture of Galls produces a slate-coloured one; but no change is caused by Ferrocyanide of Potassium.

TINCTURA CUSPARIÆ, E. Tincture of Cusparia.

Prep. Take *Cusparia* ℥ivß. in moderately fine powder and *Proof Spirit* Oij. Proceed as with Tinct. Cinchonæ; or, more expeditiously, by percolation.

Stimulant adjunct to bitter infusions, in doses of f℈j.—f℈ij.

ZANTHOXYLEÆ, made up chiefly of genera placed by De Candolle in *Rutaceæ* and in *Terebinthaceæ*, are distinguished by their flowers being usually unisexual, by the calyx being free, petals hypogynous, equal in number to divisions of the calyx, ovaries subdistinct or united, each with two ovules, fruit indehiscent, carpels opening by a vertical suture, embryo in the axis of albumen. Many of the Zanthoxyleæ are remarkable for secreting a bitter principle, *Xanthopicrine*, and also a volatile oil of aromatic pungency. Thus several species of the order are employed as stimulants: one formed the *Faghureh* of Avicenna. Species of Ptelea and Toddalia are bitter and febrifuge. Both the species of Brucea are likewise bitter and tonic. *B. antidysenterica*, the Woginos of Bruce, is most celebrated, because it was long supposed to yield the bark which was known as false Angustura, and from which the alkali *Brucia* was obtained; but the former is now well ascertained to be the bark of Strychnos Nux Vomica.

SIMARUBEÆ, *Richard.* Quassiads.

The Simarubeæ are found in the tropical parts of America, with one species in the tropic-like forests at the base of the Himalayas, and a few simple-leaved species in tropical Asia and Madagascar. They are remarkable for their bitterness. Malombo Bark is thought to be a kind of Quassia.

QUASSIA, L. E. D. Lignum. Wood of Picræna excelsa, *Lindl.* L. D. Wood, chiefly of Picræna excelsa, seldom of Quassia amara. E.

QUASSIA AMARA, *Linn. f.* Surinam Quassia. *Decand. Monog.* Linn.

Quassia Wood was first known in Europe about 1742, more fully in 1756, when Rolander returned from Surinam and gave some of the wood to Linnæus. The wood of Quassia amara, a native of Surinam, Guiana, and Panama, was first introduced into practice, and it was called Surinam Quassia; but the tree being of small bulk, and not very common, its place is supplied by the wood of Picræna excelsa. Mr. Lance informed Dr. Lindley that no Quassia had been exported from Surinam during the ten years he was at that place. The wood, as received by Dr. Pereira, is in cylindrical pieces, about two inches in diameter, very light, covered by a thin, greyish-white bark, all extremely bitter in taste. From its elegant pinnate leaves with winged footstalks, and its spike-like racemes of red flowers, this species is often cultivated as an ornamental plant in the West India Islands.

PICRÆNA EXCELSA, *Lindley.* Jamaica Quassia. *Polygamia Monœcia,* Linn.

This tree attains a height of 50, 60, or even 100 feet in the woods of the lower mountains of Jamaica and other West India islands, where it is called Bitter Ash and Bitter Wood, and its wood has for some time been substituted for that of the Surinam Quassia, and is sometimes called Jamaica Quassia. Dr. Lindley has rightly formed it into a new genus, as it agrees with the characters neither of Quassia nor of Simaruba.

This tree, besides being lofty, is erect, often three feet in diameter, with a smooth dark grey bark. The wood is white, rather coarse-grained, bitter, but without smell; the bark is moderately thick, dark-coloured, and wrinkled. Leaves pinnate, with an odd one. Leaflets opposite, 4 to 8 pairs, stalked, oblong acuminate, unequal at the base. The flowers are small, of a pale yellowish green colour, polygamous, arranged in spreading pointed racemes, which are axillary towards the ends of the branches. The sepals are 5, minute. Petals 5, longer than the sepals. Stamens 5, about as long as the petals, rather shaggy. Anthers roundish. In the male, merely the rudiments of the pistil; in the female, ovaries 3, seated on a round tumid receptacle. Style 3-cornered, trifid. Stigmas simple, spreading. Drupes 3 (but only one coming to perfection), globose, 1-celled, 2-valved, distinct from each other, and placed on a broad hemispherical receptacle. When ripe, about the size of a pea, black and shining, nut solitary, globose, with the shell fragile. (Lindley.)

Quassia-wood is imported in logs covered with a dark grey bark, smooth in the younger, rough and irregular in the larger pieces, yellowish-white and fibrous in the interior. The wood is yellowish-white and glistening; without smell, but of a pure and intense bitter-

Fig. 53.

ness; tough, and therefore pulverized with difficulty. It contains a bitter neutral principle, called *Quassine* ($C_{10}H_6O_3$), which is intensely bitter, crystalline, sparingly soluble in water and in Ether,

readily dissolved by Alcohol; also Gum, a little Volatile Oil, Lignin, salts with a base of Lime, an Ammoniacal salt, and some Nitrate of Potash.

Action. Uses. A pure Bitter, useful as a Stomachic and Tonic.

INFUSUM QUASSIÆ, L. E. D. Infusion of Quassia.

Prep. L. Macerate for 2 hours in a covered vessel *sliced Quassia* ℈ij. in boiling *Aq. dest.* Oj. Strain. E. Stronger. D. Twice as strong.

D. f℥iß. two or three times a day. A good vehicle for preparations of Iron.

TINCTURA QUASSIÆ, E. Tincture of Quassia.

Prep. Digest for 7 days *Quassia* in chips ℥x. in *Proof Spirit* Oij. Filter.

D. f℈ß.—f℈ij. as an adjunct to tonic draughts and mixtures.

TINCT. QUASSIÆ COMPOSITA, E. Comp. Tinct. of Quassia.

Prep. Digest for 7 days *Cardamom Seeds* bruised, *Cochineal* bruised āā ℥ß. *Cinnamon* in moderately fine powder, *Quassia* in chips, āā ℥vj. *Raisins* ℥vij. in *Proof Spirit* Oij. Strain, express the residuum strongly and filter. Or obtain by percolation, as directed for Compound Tincture of Cardamom, rasping or powdering the Quassia.

D. f℈j.—f℈ij. An aromatic tonic, and useful as an adjunct.

EXTRACTUM QUASSIÆ, E.

Prep. First make a watery infusion by percolation and without heat; and then evaporate, or prepare as Extract of Liquorice Root.

D. In form of pill, gr. v., or as a vehicle for metallic tonics, &c.

SIMARUBA, E. D. Simaruba amara, *Aublet.* Radicis Cortex. Root-Bark, E. D. *Monœcia* or *Diœcia Decand.* Linn.

This tree, of which the bark of the root was first introduced into practice in 1713, is a native of Guiana and Cayenne. The same species is found in the mountains of Jamaica, where it is called Mountain Damson.

The tree attains a height of 50 or 60 feet, and considerable thickness, with long horizontally spreading roots. The bark in the young parts is smooth and grey, in the older blackish coloured, and somewhat furrowed. The leaves are alternate, pinnate; leaflets alternate, 2 to 7 on each side, nearly sessile, oval, lanceolate, acuminate, tapering towards base, very smooth and entire, firm, coriaceous, of a deep green colour; petioles sometimes a foot and a half in length. The flowers are monœcious, disposed in a mixed scattered axillary panicle. The calyx is short, cup-shaped, 5-toothed or 5-partite. Petals 5, longer, twisted, and imbricate in æstivation. Male (fig. 3), stamens 10, alternate ones opposite the petals, and a little shorter; filaments each inserted (4) into a hairy scale, having a round or short gynophore (bearing rudiments of ovaries) sometimes wanting. Female flower (fig. 1) with ten scale-like rudiments of stamens; ovaries 5 on a short disk or gynophore, 1-celled, with a single ovule suspended to the inner angle. Styles 5, distinct at the base, united above, and separating again into 5 stigmata. Drupes (fig. 2) 5, or fewer by

abortion, dark-coloured, spreading, 1-celled, 1-seeded. Seeds with a membranous shell. Embryo straight; radicle above, retracted within cotyledons.—Aubl. Guian. 2, t. 311 and 312. Nees von Esenbeck, Ic. 382. v. fig. 54.

Fig. 54.

The *bark of the root* is officinal, and sent to Europe from Jamaica. It is stripped off in pieces several feet in length, which are folded upon themselves, either flat or partially quilled, a few lines in thickness, light, tough, fibrous in structure, difficult to powder, of a pale colour, greyish throughout, with the epidermis a little warty, without odour, bitter in taste. Water and Alcohol both readily take up its virtues, which depend upon the presence of a principle nearly the same with *Quassine*, Volatile Oil, Resin, Ulmine, and several salts.

Action. Uses. Bitter Tonic. Useful in advanced stages of Dysentery and Diarrhœa.

INFUSUM SIMARUBÆ, E. D. Infusion of Simaruba Bark.

Prep. E. Macerate *Simaruba Bark* bruised ʒiij. in *boiling Aq.* Oj. for two hours in a lightly covered vessel and strain. D. Similar.

D. f℥j.—f℥ij. as a Tonic. In larger doses it proves Emetic.

CEDRONE SEEDS. The seeds of the *Simaba Cedron*, a plant of this order, and a native of New Granada, have obtained a high reputation throughout Central America as a specific against the bites of poisonous serpents. They are extremely bitter in taste, and possess tonic powers, but their peculiar virtues are unauthenticated by credible witnesses, and there is in fact no reason for supposing that they would be more efficacious than Serpentary, Senega, Guaco, and other falsely reported antidotes against venomous bites. (P. J. x. 344.)

Sub-class II. CALYCIFLORÆ.

RHAMNEÆ, *R. Brown.* Rhamnads.

The Rhamneæ are found both in the temperate and tropical parts of the world. They vary in properties: some secrete a bitter principle, with which acridity is sometimes united; hence these act as stimulants to some of the functions. Some are useful for the colour (sap-green) yielded when acted on by Lime and alkalis. The fruits of a few are edible, as the Jujube, the Lotus, and the Ber of India.

RHAMNUS CATHARTICUS, *Linn.* L. E. The Juice of the Fruit, L. The Fruit, E. Common or Purging Buckthorn. *Pentand. Monog.* Linn.

Buckthorn is indigenous in hedges and woods, and found in Europe generally, flowering in May and June, and ripening its fruit in the autumn. It has long been employed in medicine, and thought to be the ῥαμνος of Dioscorides, but without proof.

Bot. Ch. A spreading shrub 8 to 10 feet high. Old branches forming thorny terminal spines. Leaves sub-opposite, ovate, cordate at base, acute, toothed, with 4 to 6 marked veins parallel to and converging to midrib. Stipules linear. Flowers polygamous, often diœcious, in clusters between the leaves, small, of a yellowish green colour. Calyx 4-cleft, tubular at base, persistent and adherent to fruit. Petals 4, a little yellowish, male flowers with a stamen opposite to each, and a rudimentary pistil. Female flower—ovary globular, with 4 single seeded cells, and a 4-cleft stigma. Fruit, a small round berry, which becomes black when ripe, containing usually 4 smooth hard seeds, which are ovate, triangular, and keeled.

Buckthorn Berries are small, round, of a black colour and shining when fully ripe; they contain a greenish pulp, which has a bitter and disagreeable taste and nauseous smell. This is composed of a green Colouring matter, of Acetic acid, Mucilage, Sugar, Azotized matter. (*Vogel.*) According to Hubert, the purgative properties are dependent on the presence of *Cathartine;* but his experiments are not considered conclusive by Soubeiran. A similar property is possessed by the inner bark.

Action. Uses. Hydragogue Cathartic; but apt to create nausea and griping.

SYRUPUS RHAMNI, L. E. Syrup of Buckthorn.

Prep. L. Take fresh *Juice of Rhamnus* berries Oiv., let it stand for 3 days that impurities may subside. Filter. To the filtered fluid Oj. add *sliced Ginger* and *bruised Pimento* āā ℥vj. Macerate with a gentle heat for 4 hours. Strain. Boil down the residue to Oiß. Mix the liquors, add *Sugar* ℔vj. and dissolve. Lastly, add *Rectified Spirit* f℥vj.

E. No spirit.

D. Generally employed instead of the berries or expressed juice, in doses of f℥ß.—f℥j.

TEREBINTHACEÆ, *Jussieu.*

The TEREBINTHACEÆ of Jussieu have been divided by modern botanists into several orders, such as *Anacardieæ, Burseraceæ, Amyrideæ,* and *Connaraceæ.* But these are all so closely allied to one another, participate in so many of the same properties, and have so much the same geographical distribution, that it is convenient to speak of the whole as forming one family under the name of Terebinthaceæ. As it contains however only one of the Turpentine-yielding plants, the rest belonging to Coniferæ, the name is objectionable.

The products of the *Terebinthaceæ* have been stated by M. Fée to consist—1. Of fixed Oil in the almond of the seed. 2. Essential Oil, which is combined with Resin in the Turpentine of the Pistacia. 3. Resin, which flows naturally, or from incisions made into the trunks, &c., of most of the species, usually combined with a little Volatile Oil. 4. Gum, seldom found pure, but frequently combined with the Resin, as in Myrrh, &c.

Sub-ord. I. ANACARDIEÆ. *R. Brown.* Anacards.

This tribe is distinguished by a single fertile ovary, 1-celled and 1-seeded. They are the *Terebinthaceæ proper.*

Anacardieæ abound within the tropics, with a few species (as of Rhus in Europe and N. America) extending to higher latitudes. Anacardieæ abound in resinous juice, with volatile oil, or acrid principle, which is employed in varnishing and lacquering. As medicines these juices act as stimulants, or are sufficiently acrid to be poisonous. The seeds of many abound in oil. The bark of some is astringent. The fruit of a few is edible.

PISTACIA, *Linn.* *Diœcia Pentand.* Linn.

Flowers diœcious, without petals. *Males* in amentaceous racemes, each supported by a scale-like bract. Calyx small, 5-cleft. Stamens 5, opposite to the calycine divisions, nearly sessile, 4-cornered. *Female flowers* in more lax racemes. Calyx 3—4-cleft. Ovary 1, rarely 3-celled. Stigmas 3, thickish, spreading, recurved. Drupe dry, ovate, with a bony commonly 1-seeded nut, sometimes showing laterally, 2 abortive cells. Seeds solitary, erect, without albumen. Cotyledons fleshy, containing oil, with a superior lateral radicle. Trees with pinnated leaves, extending from the Mediterranean region to Affghanistan. In properties resembling the Burseraceæ.

PISTACIA VERA. The Pistachio Nut tree extends from Syria to Bokhara and Caubul. It has long been introduced into the south of Europe, and is remarkable for its green-coloured kernels enclosed within a reddish-coloured testa, and where the funicle can be well seen. The kernels are oily, and an oil used to be obtained from them.

They are pleasant tasted, often eaten at dessert, either raw, or after having been fried with pepper and salt. They have also been made into a demulcent emulsion.

PISTACIA TEREBINTHUS, *Linn.* L. E. TEREBINTHINA CHIA; Oleo-resina ex inciso trunco fusa. L. Liquid Resinous Exudation of the Chian or Pistacia Turpentine Tree. E.

The Terebinth or species of Pistacia yielding the Turpentine of Chio, was well known to the ancients. It is the *Alah* of the Old Testament, translated *Oak*, *Terebinth*, &c., τερμινθος of the Greeks, and the *butm* of the Arabs. It is found in the south of Europe, Asia Minor, Syria, and the north of Africa.

A tree 20 to 40 feet in height. Leaves pinnate, with an odd one. Leaflets about 7 or 9, ovate, lanceolate, round at the base, acute, mucronate, reddish coloured when young, afterwards of a dark green colour. Inflorescence a large compound panicle. Scales of the male flower covered with brown hairs. Anthers yellowish. Stigmas of a crimson colour. Fruit purple, roundish, about the size of a large pea. Horn-shaped galls are produced on these trees.

The Turpentine of this tree is obtained in the island of Chio by making transverse incisions into the bark of the trees, of which each yields only a few ounces, and the whole island not more than 1000 pounds. The harvest is from July to October. The juice issuing from the wounds is allowed to fall upon smooth stones, from which it is scraped, and purified by being melted in the sun and strained into bottles. It used to be taken chiefly to Venice, where it was in request for making the far-famed Theriaca. Chian Turpentine is a pellucid liquid of a yellowish colour, having the consistence of honey, tenacious, with an agreeable terebinthinate smell, and moderately warm taste. Exposed to the air it thickens, and becomes hard from the loss of its Volatile Oil. A Resin is said by Belon to be produced by the same tree, and the small kernels of its fruit are edible. From its scarcity and high price, it is usually adulterated with other Turpentines, which it resembles in properties.

Action. Uses. Excitant and Diuretic, like the other Turpentines. (*q. v.* Coniferæ.)

PISTACIA LENTISCUS (*var.* CHIA), L. P. Lentiscus, E. D. MASTICHE; Resina ex inciso cortice fusa, L. Concrete Resinous Exudation of the Mastic Tree. E. D.

Mastic and the tree yielding it (Σχινος of the Greeks) were well known to the ancients, from the latter being a native of the Grecian Archipelago and of the Mediterranean region.

The Mastic shrub, about 10 or 12 feet high, is distinguished from the Terebinth tree by having its leaves pinnate without an odd one. Leaflets 8 to 10 in number, usually opposite, small, oval, lanceolate, petiole winged. Both male and female flowers small, in axillary racemes near the ends of the branches. Fruit small, roundish, of a brownish red colour when ripe.

This shrub is cultivated in the Isle of Chio, whence the Mastic is chiefly obtained by transverse incisions being made in the trunk and principal branches in the month of July. Some of it adheres to the tree in the form of tears, and some falls on the earth, and is collected in August. The best kind is in small roundish or oblong tears, of a pale yellow colour, transparent, dry, and brittle; hence usually covered with a light white powder from attrition; becoming soft and ductile when chewed; breaks with a vitreous fracture, and has a mild resinous taste and an agreeable odour, especially when rubbed or heated. An inferior kind, in masses of agglutinated tears, is darker coloured, and mixed with impurities.

Mastic melts when heated, and burns at a higher temperature, diffusing an agreeable odour. It is insoluble in water, but completely soluble in Ether. About nine-tenths (a resinous acid which has been called the *Masticic*) are soluble in cold Alcohol, and the remainder, which is soluble only in hot Alcohol, has been called *Masticine.* To this, Mastic owes its ductility when in a moist state. Besides these there is a trace of volatile oil.

Action. Uses. Little used, except as a masticatory in the East, sometimes in fumigation; most frequently by dentists for stuffing decayed teeth. It forms one ingredient of *Tinct. Ammoniæ Comp.* (p. 65); a substitute for *Eau de Luce.* Commonly used as a varnish, dissolved in Alcohol or Oil of Turpentine.

RHUS TOXICODENDRON, *Linn.* Poison Oak. *Pentand. Trigyn.* Linn.

The species of Rhus are known for their astringent and resinous, and some for their poisonous properties. The present species was brought into notice in this country by Dr. Alderson of Hull, in 1793, by following up the experiments of Du Fresnoi, made at Valenciennes in 1788.

Botanists differ as to whether this is distinct from another plant which has been called *Rhus radicans,* Poison Vine, or Poison Ivy, or whether both are only varieties of one species. *Rhus Toxicodendron* forms a shrub of a few feet in height, and has its leaflets irregularly indented or deeply sinuate, hence it is called *Poison Oak.* The leaflets are entire or rarely toothed. The leaves are long-stalked, trifoliate, with the lateral leaflets sessile, the terminal one stalked, they are broad, ovate or rhomboidal acute; leaflets smooth, sometimes a little pubescent, entire or irregularly toothed or lobed. The flowers are small, greenish white, diœcious, produced in lateral, usually axillary panicles. The *male* flowers have a small 5-partite calyx, with erect segments. Petals 5, oblong, recurved. Stamens 5 with the rudiment of a style. The *female* flowers are smaller, have 5 abortive stamens, and a globose 1-celled ovary, with a short erect style terminating in 3 stigmas. The drupes are roundish, of a pale green colour. juiceless, 1-celled, containing from abortion a bony one-seeded nut.—Bigelow's Med. Bot. 111, t. 42.

This plant is not now officinal, though it was included in the L. P. of 1836. It is irritant, and has an action on the muscular system, which resembles that of Strychnia. The leaves, which alone were

used, contain a peculiar acrid principle, to which, probably, their medicinal properties are owing.

Action. Uses. Acrid, Stimulant. Useful in some cases of Paralysis, twitches and pricking of the affected limb being experienced.

D. gr. j.—gr. v. till pricking commences. A tincture or an Extract of the fresh leaves is preferable (*c*).

Sub-ord. II. Burseraceæ. *Kunth.* Balsamads.

The Burseraceæ are distinguished among Terebinthaceæ by their many-celled germen, and by their ovules being pendulous and in pairs; also by their plaited convolute cotyledons. They are all found in tropical parts of the world. The juice of these plants is famed for its balsamic odour and stimulant properties: *e.g.* Balsam of Gilead, Olibanum or Frankincense, Myrrh, Bdellium, Elemi, &c.

Olibanum. Gummi-Resina. Boswellia thurifera, *Colebr.*

This gum-resin was included in the late editions of the L. and D. P., but is not now officinal.

The name Olibanum seems to be derived from the Greek λιβανος, and this probably from the Hebrew *lebona.* This is very similar to the Arabic *luban*, which signifies *milk*, or the juice exuding from a tree, and is applied especially to what used in early times to be called Thus, and more recently, Olibanum. Two kinds of Olibanum are known in commerce, one Indian, the other African.

The Indian is imported in chests chiefly from Bombay, also from Calcutta, but the place producing it is not well ascertained. Mr. Turnbull, of the Medical Service, many years since sent some resin of the *Salai* tree collected in the hills near Mirzapore, which in the London market was recognized as Olibanum. Mr. Colebrooke determined that *luban* or Olibanum is produced by a tree called *salai.* The author has also collected a very fragrant resin from the *saleh* tree of North-west India, which bears a very close resemblance to common Olibanum. This tree is *Boswellia glabra*, Roxb., the former is *B. thurifera* of Colebrooke, called *B. serrata* in many works; but as Messrs. Wight and Arnott say, "we dare not quote here *B. serrata*, Stack. extr. Bruc. p. 19, t. 3, the leaves being usually described as ovate, oblong, and acuminate." Both species were collected by Col. Sykes in the Deccan as the Olibanum-tree. Dr. O'Shaughnessy states that he has received fine specimens of Olibanum from the Shahabad district, where it is called *salegond*, and at Chandalgur *gunda barosa.*

This tree (Boswellia thurifera, fig. 55) grows to a large size in hilly situations, from the Coromandel coast to the central parts of India. It is much branched but bare of leaves in its lower parts, but these are crowded and alternate towards the ends of the branches, unequally pinnate. Leaflets oblong, obtuse, serrated, pubescent. Stipules none. Inflorescence in single axillary racemes near the ends of the branches, shorter than the leaves. Flowers on short pedicels, of a pinkish white colour. Flowers bisexual (v. 55, 1.) Calyx small, 5-toothed. Petals 5, obovate, tapering to the base, inserted under the margin

of the disk; æstivation slightly imbricate. Disk surrounding the base of the ovary, cup-shaped, fleshy, crenulated. Stamens 10, inserted under the disk. Ovary sessile, 3-celled, with 2 ovules in each, attached to the axis. Style terminated by a capitate 3-lobed stigma. Fruit capsular, 3-angled, 3-celled, 3-valved, septicidal (splitting at the angles into valves). Seeds solitary in each cell, girded by a membranous wing. Cotyledons intricately folded, multifid.

Fig. 55.

Indian Olibanum, which is the most esteemed, is in roundish or oblong tears, of a reddish or a light yellow colour, usually covered with whitish powder, from attrition of the pieces against each other, translucent within, of a warm bitterish taste, and having a balsamic odour, especially when warmed or burnt. Sp. Gr. 1·22. A fine specimen, analysed by Dr. O'Shaughnessy, gave of Resin 37 parts, Volatile Oil 28 parts, Gum 4, Gluten 11, in 100 parts. But the quantity of Volatile Oil is necessarily much less when it has been exposed and become dry, as seen in commerce. Braconnot obtained only 8 per cent. of Oil, of Resin 56, Gum 30, matter like Gum 5·2, loss 0·8=100.

African Olibanum imported into Venice and Marseilles from Suez, and obtained from Arabia and the east coast of Africa, is mentioned by Dr. Pereira as African or Arabian Olibanum, and as occurring in smaller tears than the Indian variety, yellowish or reddish, and intermixed with crystals of Carbonate of Lime. One kind of African Olibanum is no doubt produced on the hills of the Somauli coast westward from Cape Guardafui, and carried to the Arabian coast chiefly by native boats from Maculla. This tree, partially described by Capt. Kemthorne of the Indian Navy, has been identified by Mr.

Bennett of the British Museum with *Plöslea floribunda* of Endlicher, but which appears to the author to be nothing but a species of Boswellia, which he would therefore call *B. floribunda*. The specimens are covered with little resinous exudations, as are the leaves of a plant collected in the island of Socotra by Lieut. Wellsted, which also appear to be those of a Boswellia.

Action. Uses. Stimulant. Sometimes used in chronic affections of mucous membranes, but chiefly in plasters, and as a fumigation.

MYRRHA, L. E. D. Balsamodendron Myrrha, *Nees*. Gummi-resina e cortice exudata, L. Gummy-Resinous Exudation, E. D. Myrrh. *Octand. Monog.* Linn.

Myrrh is first mentioned in Exod. xxx. 23, by the name of *Mor* or *Mur*. The Arabic name also is *Mur*. The Greeks called it μυῤῥα, and also Σμύρνα. Herodotus mentions it as produced in the South with Frankincense, &c. Dioscorides states the variety called *Troglodytica* to be the best. In the Periplus of the Red Sea, Arrian mentions Myrrh with Olibanum as exported from the coast of Barbaria, that is, the modern Berbera. Bruce learnt that it was produced, as well as Frankincense, in the country behind Azab, or in that of the Dankali. The embassy to Abyssinia under Major Harris met with it on the hills in the comparatively flat country which extends from Abyssinia to the Red Sea near the Straits of Bab-el-Mandeb, or from the Doomi Valley to the banks of the Hawash. Mr. Johnston (Trav. i. p. 249) met with it in nearly the same locality. Both authors describe the Myrrh as exuding from wounds made in the bark, and state that it is collected in January and March (H.), but chiefly in July and August, and in small quantities at other times of the year (J.), and exchanged for Tobacco with the merchants who proceed to Berbera, &c., whence it is exported to the coast of Arabia.

Dr. Malcolmson writes to the author from Aden, that it is exported in native boats from different ports in the Red Sea, but chiefly from Berbera, Zela, and Massowah, and adds "there is no Myrrh produced in Arabia."

Myrrh, it is well known, now reaches Europe chiefly from Bombay, having been imported from the Arabian and Persian Gulfs. It used formerly to be obtained also from Turkey. Some Myrrh, however, appears to be produced in Arabia, as Ehrenberg and Emprich found a small tree in Arabia near Gison, on the borders of Arabia Felix, from off which they collected some very fine Myrrh. There is still considerable uncertainty respecting the plant or plants which yield Myrrh, though it is probable they all belong to the genus Balsamodendron.

BALSAMODENDRON, *Kunth*. Amyris. Protium. *Wight and Arnott*.

Flowers often unisexual. Calyx 4-toothed, persistent. Petals 4, linear, oblong, induplicately valvate in æstivation. Stamens 8, inserted like the petals

under the margin of the annular disk or torus, which is cup-shaped, fleshy, deeply crenated. Ovary 2-celled. Style short, obtuse, 4-lobed. Drupe globose or ovate, nut thick and very hard, bony, 2-celled (one of the cells by abortion often obliterated), cells one-seeded.—Balsam-producing trees. Leaves with 3 to 5 sessile leaflets, which are without dots.

B. Gileadense, K. Unarmed. Leaves palmately 3-foliolate, petiolate, smooth; leaflets obovate, oblong, very entire, glabrous; pedicels short, single-flowered, with the calyx broad, shallow, and campanulate.—This includes the *Amyris Opobalsamum* of Forskal; but fresh specimens and recent observations are required to distinguish whether this is different from the *Balessan* of Bruce. Other species which are found in the Peninsula of India and are *spinescent*, used to be included under it, but are considered distinct by Dr. Arnott, who does not now unite them with *Proteum* (as in the Prod. Fl. Ind. Penins.) from which indeed they differ much in habit. Yields *Balm of Gilead.*

The *Balessan* of Bruce was found by him at Azab, and said to extend to the Straits of Bab-el-Mandeb. Gerloch found it at Bederhunin, a village between Mecca and Medina. Forskal found his Opobalsamum at Haes in Arabia Felix. At Aden it is called Beshan. Dr. Roth, in the Appendix to Harris' Abyssinia (ii. p. 414) mentions B. Opobalsamum as occurring in the Adel country and the jungles of the Hawash along with the Myrrh tree. The bark when wounded exudes the fragrant and far-famed Balsam, which has been called Balm of Gilead, but which seems to have been only cultivated in Palestine near the town of Jericho. It is now never obtainable in Europe in a pure state, and therefore seldom if ever employed medicinally, though it is no doubt possessed of stimulant properties.

B. Myrrha (fig. 56.) Stem shrubby, arborescent; branches squarrose, spines-

Fig. 56.

56. Balsamodendron Myrrha. 1, 2, 3. B. Kataf.

cent. Leaves ternate; leaflets obovate, obtuse, obtusely denticulate at the apex, the lateral smooth. Fruit acuminate (Nees).

Bark pale ash-grey, approaching white. Wood yellowish-white; both it and the bark have a peculiar odour. Leaves on short stalks. Flowers unknown. Fruit ovate, smooth, brown, somewhat larger than a pea; surmounted at the base by a four-toothed calyx, and supported on a very short stalk.

The author has adopted the above description, as translated by Dr. Pereira, who has closely followed the account given by Nees von Esenbeck, in the folio work *Beschreib. Officin. Planzen*, where he says that his friend Dr. Ehrenberg collected from off this tree "*sehr schöne Myrrhe*," and that the description is taken from the specimens of the plant collected by Ehrenberg at Gison, on the borders of Arabia Felix.

Though it is not very probable from modern information that any large quantity of Myrrh is produced in Arabia, yet it is possible that some may be produced there, and from the same species of plant as that which yields the large quantities of Myrrh in Africa. Indeed, it is stated in the Appendix to Harris' Abyssinia (ii. 414), probably on the authority of Dr. Roth, that the "*Balsamodendron Myrrha* (*Karbeta* of the natives) grows on the borders of Efat and in the jungles of the Hawash, and in the Adel desert. The resinous gum called *Hofali* is collected for exportation. *B. Opobalsamum* (Besham) grows commonly with the former, and grows even at Cape Aden." Unfortunately there are no specimens of either plant in the Herbarium collected by the embassy and sent to the India House.

On examining the specimens in the British Museum of *B. Opobalsamum*, or *B. Gileadense*, now united into one species, it appears to the author that the specimens vary sufficiently to require careful examination and detailed description of good and complete specimens, before we can distinguish them as varieties, or determine them to belong to separate species; also, it is not clear whether the above *B. Myrrha* itself differs sufficiently to constitute a distinct species. The drawing of Nees, of which the annexed woodcut (fig. 56) is a copy, appears to the author to resemble some of the Arabian specimens of *B. Opobalsamum* very closely. All are very distinct, both in foliage and inflorescence, from *B. Kataf* (v. 56, 1, 2, 3), of which a specimen collected by Forskal is in the British Museum. The species referred to by Dr. Roth are probably the same as the following.

Mr. Johnston, also, in his Travels through Adel to Abyssinia (i. p. 247), in treating "of the tree that yields this useful drug, Myrrh," says "there are in the country of Adel two varieties, one, a low, thorny, ragged-looking tree, with bright green leaves, trifoliate, and an undulating edge, is that which has been described by Ehrenberg." (v. the annexed figure, 56.) "This produces the finest kind of Myrrh in our shops." This may be either the above *B. Myrrha* or one of the forms of *B. Opobalsamum*. "The other is a more leafy tree, if I may use the expression, and its appearance reminded me exceedingly of the common hawthorn of home, having the same largely serrated, dark-green leaves, growing in bunches of four or five, springing by several

leaf-stalks from a common centre. The flowers are small, of a light-green colour, hanging in pairs beneath the leaves, and in size and shape resemble very much the flowers of our gooseberry-tree. It belongs to the Octandria Monogynia, the eight stamens being alternately long and short, the former corresponding to the four partial clefts in the edge of the one-leafed calyx. The fruit is a kind of berry, that when ripe easily throws off the dry shell in two pieces, and the two seeds it contains escape. The outer bark is thin, transparent, and easily detached ; the inner, thick, woody. When wounded, a yellow turbid fluid (the gum-myrrh) immediately makes its appearance. Naturally, the gum exudes from cracks in the bark of the trunk near the root, and flows freely upon the stones immediately underneath. Artificially, it is obtained by bruises made with stones."

This plant, judging from the specimens deposited by Mr. Johnston in the British Museum, corresponds exactly with one, also in the same collection, obtained by Mr. Salt in Abyssinia, *Balsamodendron Kua* of Mr. Brown's MSS., and of which Mr. Salt says, he obtained from it a gum much resembling the Myrrh.

B. Africanum, *Arnott.* (*Heudelotia africana*, Guill. et Per.)

B. Mukul, *Hook ;* and B. pubescens, *Stocks.** Trees producing Bdellium.

The first species, found in the west of Africa, occurs also in the Abyssinian collection, having been found in the flat country of the Adel.† It yields African Bdellium, or that imported into France from Guinea and the Senegal, according to M. Perrotet. M. Adanson, likewise, in his Travels in the Senegal, mentions it by the name of Niotout, as producing Bdellium. It may also yield the Bdellium which is exported from the west coast of Africa. Dr. Malcolmson writes to the Author that " Bdellium (of which he sends a specimen) is produced in Africa by a tree similar to the Myrtle. None is obtained in Arabia. It is very similar to Myrrh, and sometimes sold for it."

One kind of Bdellium is produced in India, which the author was informed was yielded by a tree called *googul* by the natives (v. Himal. Bot. 177), and which is the *Amyris Commiphora* of Roxb. referred by Messrs. Wight and Arnott to Balsamodendron. It is the *Balsamodendron Mukul* of Hook. Dr. Walker, in his account of the drugs produced near Aurungabad, states " a gum-resin, called by the natives *googool*, is produced by a tree which grows in the neighbourhood of Umber, a town twenty miles to the westward of Aurungabad. Roxburgh imagined that Googool was identical with Myrrh."

But the whole of the species of this genus require to be carefully examined from good and authentic specimens accompanied by their respective products, before the several doubts can be resolved.

* See Dr. Stocks on Balsam Trees of Scinde.

† Mr. Johnston immediately recognized it as one of the trees yielding gum-resin. The leaflets are like those of *B. Kua,* Br.

Prop. Myrrh is imported from Bombay. It is generally in pieces of irregular form and size, formed apparently of agglutinated tears, dry, and covered with a fine dust, commonly of a reddish-brown colour; brittle; fracture irregular, conchoidal, shining; with the surface apparently dotted with volatile oil, often varied with opaque, whitish, semicircular marks; the smaller pieces angular, shining, semi-transparent; taste bitter and aromatic; smell peculiar and balsamic. Other kinds are also met with, probably derived from the same source, as it sometimes reaches this country with the different qualities intermixed (*Myrrh in sorts*) or consisting of finer pieces picked out (*Turkey or picked Myrrh*). But when the process is adopted abroad, the inferior qualities may come separately or remain intermixed with other gums or resins, especially Bdellium, from the careless manner in which all are collected by the natives. The specimens brought by the Abyssinian embassy have *granular* fragments mixed with roundish tears; and some of a pale, even whitish, colour may be seen on the same piece of bark with ordinary coloured Myrrh. The specimens which have not been exposed to the air are darker coloured, moister, and of a more powerful and agreeable smell.

Indian Bdellium is sometimes sold for and considered as an inferior kind of Myrrh. It is in roundish pieces of a dull dark-red colour, more moist than Myrrh, and not brittle like it, softening even with the heat of the hand; bitter, and a little acrid in taste, with a less agreeable odour. It often has portions of the birch-like bark adhering to it.

Myrrh, when heated, first softens, then burns partially, leaving a black spongy ash. Triturated with water, it forms an emulsion: the Alcoholic tincture is rendered opaque on the addition of water. It is a Gum-resin, with volatile Oil, and salts of several acids combined with Potash and Lime. The Gum, about 63 per cent., consists of two kinds, one-half being *Bassorin*, or insoluble, and the remainder *Arabin*, or soluble Gum. This last, being dissolved in water, helps to suspend the Resin and Oil. The Resin, about 28 per cent., is also of two kinds; one soft, odorous, and soluble in ether; while the other is hard, without odour, soluble in alkalis. The volatile Oil, about 2·5 per cent., passes over if distilled with water; it is at first without colour, but becomes yellowish; has the odour and taste of Myrrh; is soluble in Alcohol, Ether, and the fixed Oils. Upon it and the Resin the properties of Myrrh depend.

Action. Uses. Stomachic, Excitant, Stimulant Expectorant, Antispasmodic, Emmenagogue.

D. gr. x.—ʒß.; but usually united with tonics or with purgatives.

Tinctura Myrrhæ, L. E. D. Tincture of Myrrh.

Prep. L. Macerate for 7 days powdered *Myrrh* ℥iij. in *rectified Spirit* Oij. Strain. E. D. Similar. The E. C. adds, that it may conveniently be prepared by percolation.

Action. Uses. As rectified Spirit is the best solvent for the Resin

and volatile Oil of Myrrh, this is an effective preparation in doses of f℥ß.—f℥j. But it is usually only employed as an adjunct, or as an external stimulant application to foul and indolent ulcers.

Off. Prep. Mist. Ferri Comp. L. E. D. Pil. Ferri Comp. L. Pil. Assafœtidæ Comp. E. Pil. Galbani Comp. L. Pil. Aloes cum Myrrhâ, L. E. D. Pil. Rhei Comp. E. Tinct. Aloes et Myrrhæ, E. Decoct. Aloes Comp. L. E. D.

Elemi, L. E. D. Planta incerta: terebinthina concreta, L. Concrete Resinous Exudation from one or more unascertained Plants, E. D. Elaphrium elemiferum, *Royle*, yields Mexican Elemi.

Elemi has long held a place in works on Materia Medica, but great uncertainty has always prevailed respecting both the country and the plant producing it. C. Bauhin mentions it as Elemi and Elemni officinarum. J. Bauhin (1650) describes it as being in cylindrical pieces, of the consistence and colour of yellow wax, with the odour nearly of Fennel, and wrapped up in a leaf which appears to be that of Canna indica. Ray (1688) states that many consider it to be the gum of the Ethiopic Olive, and the word Elemi to be derived from Elea. He refers to a passage "ex Andreæ Bacci autoris gravissimi lib. 5. de Vinis Apulis," who states that in Apulia the Olives grow to a great size, and on account, he thinks, of the great and continued heat, exude a very excellent gum, "quod Chirurgi gummi Elemi appellant." There appears no evidence to connect Elemi with the Ethiopian Olive of Dioscorides, nor does there seem any proof that it was ever obtained from thence. Indeed, J. Bauhin, as early as 1650, says of Elemi, "De loco ejus natali nihil adhuc certi accessimus."

From America, however, a resin was early received, which had the characteristics of Elemi. Marcgraaf describes a Brazilian tree, called *Icicariba*, which exudes a very fragrant resin smelling like freshly bruised Anethum. His editor, De Laet, says that large quantities of this resin are brought from New Spain, and that it is also collected in Brazil. The American Elemi seems for a long time to have been the only kind procurable, except a factitious preparation made with yellow resin, turpentine, and oil of spike, for making which directions are given by Savary and others. M. Guibourt states, as Rutty had done, that both kinds of Elemi come from America, and that that of Brazil, which Geoffrey calls the *false*, is in the present day the most esteemed, on account of its strong but pleasant odour, which is owing to the presence of much volatile oil. If this kind does actually come from Brazil, it is most probably procured from the above Icicariba of Marcgraaf, *Icica Icicariba*, Dec., as Martius, in his *Syst. Materiæ Med. Brazil.* p. 118, mentions "Elemi occidentale, which in stimulant and healing powers excels the other balsamic resins of Brazil," as obtained from this tree. He also enumerates other species of Icica indigenous in the same region, which pour out balsams which when dry are known as different kinds of Elemi and of Anime.

But Elemi has, for some years at least, been imported direct from Mexico, and the author has received specimens from Dr. Budd, to whom they were given by R. Cotesworth, Esq., who imports Elemi as an article of commerce from Mexico. These specimens were accompanied by specimens of the trunk, branches, leaves, and fruit; but unfortunately, mostly all detached from their points of insertion. The materials are, however, sufficient to determine that they belong to the genus *Elaphrium*, and that the species is a new one, which the author has named *E. elemiferum*, from its produce. To this probably early accounts refer, as the Elemi-like produce from New Spain.

ELAPHRIUM ELEMIFERUM, *Royle.*

Twelve feet high? stem three inches in diameter; wood white, spongy; bark about a line in thickness, rugose, of a reddish-brown colour, but covered with a grey epidermis and lichens; branches tortuous; twigs smooth, somewhat angular, striated, and flexuose; leaves exstipulate, unequally pinnate; rachis winged; leaflets 3 to 10 pairs, opposite, without dots, very variable in form, ovate, obtuse, even roundish, entire or ovate-acuminate, irregularly toothed, the terminal one usually elongated acute, the lateral ones, especially the lower pairs, are sometimes ternately or pinnately cut, with their petioles also winged; at other times all the leaflets are rhomboidal and deeply cut into acute segments; all are smooth and shining on the upper surface. Flowers not seen. Drupes ovoid and rather acute, composed of a thick and tough epicarp, which splits into two valves, and displays the blackish apex of the seed, of which the lower part is enveloped in a reddish-yellow aril-looking body (membrana tenui (pulpa molli testi, *Jacq.*) vestita, *Kunth.* in ch. Generis), which exhales a strong odour of Elemi when scraped; seed single, ovate, one being abortive; cotyledons contortuplicate; radicle above.—Native of Mexico, near Oaxaca.

Elemi has also been imported, for several years at least, from Manilla into the London market. It is then in masses of a light yellowish colour, internally soft, and about the consistence and appearance of thick honey; smelling strong of fennel, and in this respect resembling that imported from Mexico. Though it is possible that this might be conveyed as an article of commerce from Acapulco to Manilla, yet M. Perrotet obtained, in the Philippine Islands, a produce like Elemi from a Terebinthaceous tree.

Canarium commune (C. zephyrinum of Rumph, H. A. ii. t. 47), cultivated on account of its kernels in the Spice Islands, and extending even to Ceylon, yields a resin, which Rumph describes as white and tenacious, of the consistence of suet, becoming by degrees yellow, and when fresh, exhaling a strong odour; that of the wild plant, he describes as "substantia, colore, et odore, adeo similis est Gummi Elemi, ut pro eo haberetur."

Dr. Pereira has received from Dr. Christison the resin of *Canarium balsamiferum* of Ceylon, which in odour and general appearance strongly resembles Elemi. And the resin called *Arbol-a-brea* at Manilla, which somewhat resembles Elemi, is considered by M. Baup to be the product of *Canarium album*, a tree which is common in the Philippines.

If the Molucca resin should be found to be exported, it will account

for our having for many years received one kind of Elemi from Holland, as was long since stated to be the case by Pomet, and as has been traced out by Dr. Pereira, whence he rightly concluded that it was the produce of a Dutch settlement.

Hence it appears that the different kinds of Elemi are produced—

BRAZILIAN ELEMI, by *Icica Icicariba.* Marcg. Ic. p. 98. Piso, Ic. p. 59. Martius, Pl. Med. t. 22.

MEXICAN ELEMI, by *Elaphrium elemiferum.* Royle.

MANILLA ELEMI, probably by *Canarium commune*, Linn. Rumph, H. A. ii. t. 47. Kœnig. An. Bot. t. 7, f. 2.

Elemi necessarily varies according to the source whence it has been obtained; but it has generally something of a waxy appearance, is of a light yellow tint, changing to a deeper colour, with occasionally a tinge of green; soft or hard, dry or moist, according to the time it has been exposed, and the degree in which the volatile oil has become evaporated. The odour of the different kinds varies in fragrance, being more or less agreeable, but in some smelling strongly of fennel, especially when the resin is freshly imported and moist; in others, this odour is mixed with that of lemons. Factitious Elemi is of a dark yellow colour, is something like yellow resin, but with more of a terebinthinate odour. The Elemi analysed by Bonastre yielded 60 parts of Resin, 24 of a peculiar crystalline body, *Elemine*, insoluble in cold Alcohol, 12·5 of volatile Oil, 2 of Bitter Extractive, and 1·5 of impurities. But the volatile Oil must be in much larger proportion in recent specimens.

Action. Uses. Stimulant. Formerly an ingredient of the ointment of Arcæus. The Turpentine must destroy the Elemi odour in

UNG. ELEMI, L. D. Elemi Ointment.

Prep. L. Melt *Elemi* ℥iij. with *Suet* ℥vj.; then remove from the fire, and add together *Turpentine* ℥iiß. and *Olive oil* f℥ß. Press through linen. D. *Elemi* ℥iv. to *Ointment of white wax* ℔j.

LEGUMINOSÆ, *Juss.* Leguminous Plants.

The *Leguminosæ* are so named from the fruit of all consisting of a legume or pod, and form one of the largest of the natural families of plants. They may be divided into several very natural groups, but are usually treated of under the head of three sub-orders named Mimoseæ, Cæsalpineæ, and Papilionaceæ.

Sub-ord. I. MIMOSEÆ, *R. Brown.* Mimosads.

In this division the flowers are regular, usually spiked or capitate. Sepals and petals 4—5, valvate. Stamens numerous, free or monadelphous.

The Mimoseæ are found in tropical parts of the world, with comparatively few species in the north, but great numbers in the south temperate zone. They are characteristic of hot dry parts of the world. Many of the species exude gum and secrete astringent principles in their bark, wood, and fruit.

Acacia, *Dec.* *Polygamia Monœcia*, Linn.

Flowers polygamous. Calyx 4 to 5-toothed. Petals 4—5, either free or united together, and forming a 4—5 cleft corolla. Stamens varying in number from 8—200, distinct or united into bundles. Legume continuous, dry, bivalved. Seeds without pulp. Shrubs or trees, unarmed or provided with stipular thorns or scattered prickles. Flowers yellow, white, or occasionally red, in globular heads or elongated spikes. Several of the species exude gum, and store up astringent matter in the wood, bark, and legumes.

Acacia, L. D. Gummi Acaciæ, E. Gummi e cortice exudatum, aere induratum, L. Various species of Acacia, L. E. A. vera, A. Verek, and other species, D. Gum Acacia or Gum Arabic.

Gum, being an exudation from many trees, especially in warm and dry climates, must have been known from the most remote antiquity; and hence we find it mentioned by early Greek writers. It probably formed an article of commerce from Africa into Europe in ancient as it does in modern times. Gum being required for use in the arts as well as in medicine, large quantities are imported from the west and the east coast of Africa, from Egypt, Arabia, India, New Holland, and from the Cape of Good Hope.

1.—*Gum Arabic*, so called from being supposed to be produced in Arabia, is imported in immense quantities from Africa into Aden; none is collected and very little produced in Arabia. (Malcolmson.) It used to be produced in Upper Egypt and Nubia. M. Pallme describes the gum as being collected in Kordofan, especially in the district of Bara, in November, December, and January; as being of the finest quality, and erroneously named Gum Arabic; from 10,000 to 14,000 cwt. annually being conveyed on camels from Bara to Dongola on the Nile, whence it is carried to Cairo, and thence distributed to Europe. As the whole of the arid desert country is covered with Acacia trees, much is also conveyed to the ports of the Red Sea, and from thence to the opposite coast of Arabia, whence it is re-exported to Bombay, and from thence to this country. This gum is probably yielded chiefly by *A. Seyal*, *A. Ehrenbergii*, and *A. tortilis;* and a very little by *A. vera*, and *A. arabica.*

M. Pallme says that the Gum-tree of Kordofan differs materially in the shape of the tree, its leaves, and spines, from the Mimosa nilotica, that is, *Acacia vera.*

Mr. Johnston, when near the Hawash, had given to him a lump of soft Gum Arabic, nearly a pound in weight, and of most agreeable flavour, like a green ear of corn. He mentions at the same time, that the trees were without exception the long-thorned Mimosa, and tall enough to ride under. It was probably the *A. tortilis* or *A. Seyal.*

2.—*Gum Senegal* is exported from Portendic, Sierra Leone, and the French settlements on the Senegal, being produced chiefly in the desert country to the north of this river.

Acacia Verec is stated by the authors of the Fl. de Senegambie to yield the pale and fine varieties, *A. albida* (*A. Senegal*, Willd.), and *A. Adansonii* the inferior reddish varieties. *A. Seyal*, *A. vera*, and *A. arabica*, being found in Senegambia, probably also yield some of the gum exported from the western coast.

3.—*Barbary Gum* is exported from Mogador on the west coast of Africa, and is produced in a similar kind of country. It is an inferior product, and, moreover, a mixture of two or three kinds.

Acacia gummifera is thought to yield some of this gum. Jackson gives *attalet* as the name of the tree which produces gum.

4.—*East India Gum* is exported to Europe chiefly from Bombay, having been previously conveyed there from the coast of Arabia; so that it is chiefly of African origin. But some of Indian origin is also exported from Calcutta and Bombay by the names of Babool Gum and Gum Gattie, which is that of the *Acacia arabica*, and is of good quality; and Gum is yielded also by *Acacia Serissa*, and *A.* (now *Vachelia*) *farnesiana*, as well as by species of other genera.

5.—Gum is also imported from the Cape of Good Hope, yielded by *Acacia Karroo*, according to some. Dr. Pappe (Floræ Cap. Med. Prodromus) states that the Cape gum is derived from the *A. horrida*, called *Doorn boom* by the settlers; also, that a superior gum is obtained from the *A. Giraffæ*, or *Kameel doorn*, a tree which grows beyond the limits of the colony.

6.—*A. decurrens* yields gum in New Holland.

As space cannot be afforded for all, we will restrict ourselves to one of the best known of the officinal species.

ACACIA VERA. Willd. (*Mimosa nilotica*, Linn.) A middling sized tree, with spines in pairs, straight, sharp, about a quarter to half an inch long. Leaves bipinnate, and, as well as the branches, smooth; these are covered with a reddish-brown bark. Two pairs of pinnæ, leaflets small, 8 to 10 pairs, oblong linear, with a gland between the pinnæ. Flowers in yellow globose heads, from 2 to 5 in the axillæ of the leaves, and stalked. The legume is moniliform, short, straight, and containing but few seeds. A native of Egypt, and extending across Africa to the Senegal. An astringent extract, known to the ancients by the name of *ακακια*, was prepared from the legumes of this and probably of other species. The Author obtained it in the bazars of India by the old name of *akakia.*

Gum, dissolved in water or in the form of a mucilage, is a very generally diffused principle of vegetables. It flows from the several Acacias in a liquid state, but soon hardens, and may be seen from a perfectly colourless substance to different shades of yellow, even on the same tree. It is in dry, semitransparent, roundish masses, of the size of a small nut, or larger, often in fragments, rugose at the surface, brittle, friable; fracture vitreous; without odour; of a mild, slightly sweetish, viscous taste. Sp. Gr. about 1·31 to 1·52. It is soluble in water, having a slightly acid reaction on litmus. The finer pieces are often separated after being imported, and form the picked or Turkey Gum; the inferior kinds are in larger or irregular pieces, of a deeper

colour, more mixed with impurities, and less soluble.* It is insoluble in Alcohol, which, indeed, precipitates it from its watery solution. Sesquichloride of Iron forms with it a brown jelly. Diacetate of Lead and Silicate of Potash also cause a white precipitate in this solution. Boiled with Sul′, a variety of Sugar is produced; but if with Nit′, Mucic and Oxalic acids. Subjected to heat, it loses 17·6 per cent. of water. It yields 3 per cent. of ashes, composed chiefly of Carbonate of Potash and Carbonate of Lime, with a minute portion of Oxide of Iron, and contains 79·6 of soluble Gum or *Arabin*, which displays the characteristics of pure Gum, and is composed of $C_{12}H_{11}O_{11}$ or $C_{24}H_{22}O_{22}$ (*Liebig*), and is therefore identical in composition with Cane Sugar.

Adulterations. The inferior kinds of Gum are apt to be intermixed with the finer kinds of African Gum, especially when powdered; when in this state, starch also is apt to be added, but may be detected with Iodine.

Action. Uses. Demulcent. Used in its solid form, or in powder, or in the form of Mucilage.

MISTURA ACACIÆ, L. Mucilago Acaciæ, D. Mucilago, E. Mucilage.

Prep. L. Rub *powdered Acacia* ℥x. with boiling *Dist. Water* Oj. poured in by degrees, until it is dissolved. The E. and D. C. order *cold* water, and strain the mucilage.

Action. Uses. Demulcent. May be taken *ad libitum.* Employed pharmaceutically to suspend powders, or to make a mixture with oily and resinous substances. The E. process is the best, as heat is injurious.

MISTURA ACACIÆ, E. Acacia Mixture.

Prep. Steep in hot *Aq. Sweet Almonds* ʒj. and ʒij. peel and beat them to a smooth pulp in an earthenware or marble mortar, first with *Pure Sugar* ʒv. and then with *Mucilage* f℥iij. add gradually *Aq.* Oij. stirring constantly. Strain through linen or calico.

Action. Uses. Demulcent: resembles *Mistura Amygdalæ*, L. E. D.

TROCHISCI ACACIÆ, E. Acacia Lozenges.

Prep. Mix *Gum Arabic* ℥iv. *Starch* ℥j. and *Pure Sugar* ℔j. with *Rose-water*, and make into a mass fit for forming into lozenges.

CATECHU. Acacia Catechu, *Willd.* Ligni interioris Extractum, L. Extract of the Wood, E. D. Catechu.

The early history of Catechu is obscure: it must have been known in India from very early times, as it is one of the ingredients of the

* M. Picciotto proposes to purify coloured and impure sorts by dissolving them in a strong solution of sulphurous acid, by which means the colour is discharged. The acid being removed by the addition of Carbonate of Baryta, with which it forms an insoluble Sulphite, the decolorized gum is obtained by filtration and evaporation of the solution. (P. J. ix. 16).

compounds which they chew with the leaf of the Betel Pepper. But the Persian works on Materia Medica in use in India do not quote any Arabic or Greek names for it. It was known to Garcias ab Horto, who supposed it to have been the Lycium of Dioscorides. But this the author has found to have been the extract of Barberry-root.*

A great variety of extracts are now known, which are prepared from the wood, bark, leaves, and fruit of various plants. Besides the *Acacia Catechu*, the E. P. alludes to that prepared from the Betel-nut, or seed of the *Areca Catechu;* and all three colleges mention the *Uncaria Gambir*, from the leaves of which is extracted the kind called in commerce Terra Japonica or Gambir, which is prepared in square pieces. (*v.* Cinchonaceæ.) The Acacias, however, are most noted for the secretion of astringent principle in the wood, bark, and legumes of various species, which hence form articles of commerce, and are employed in tanning. And none are more valuable in this respect than the officinal species yielding Catechu.

Fig. 57.

ACACIA CATECHU. *Willd.* A tree from 15 to 20, but sometimes 30 feet high, with hard and heavy wood of which the interior is of a dark red or brownish colour, and the sap-wood white. Branches with stipulary thorns. Leaves bipinnate. Pinnæ 10 to 15 pairs. Leaflets 30 to 50 pairs; linear oblong, unequal and auricled on the lower side at the base; petiole angular, often armed in arid situations with a row of prickles on the under side, with one large urceolate gland below the lowest pair of pinnæ and smaller ones between the 2 to 4 terminal ones. Inflorescence a spike, 1 to 3 together in the axillæ of the leaves. Flowers numerous white. Calyx downy, 5-fid.

* See a Paper on the Lycium of Dioscorides, by the Author. Linnean Trans. vol. xvii. p. 83.

Petals united into a 5-fid corolla. Stamens numerous, distinct, double the length of the corolla. Ovary shortly stipitate. Style the length of the stamens. Legumes straight, thin and flat and smooth, with about 4—6 seeds. A native of the jungles and low hills of many parts of India.—Roxb. Corom. Plants, 11, t. 175.

Catechu, (called *Kut* and *Kutch* by the natives of the East,) is properly an extract prepared from the wood of the above tree; but the term is now applied also to other *extracts* similar in appearance and properties. It should be confined to these, and the term Kino applied to astringent *natural exudations.* The mode of preparing Catechu, by cutting into chips the inner brown coloured wood, and making a decoction which is afterwards evaporated to a proper consistence, was first accurately described by Mr. Ker, as practised in Behar; so it is on the confines of Nepal. The Author has seen the same process in north-west India. We have evidence that it is so prepared on the Malabar coast, and also in Ava, from the same tree.

There is no proof that any Catechu is obtained from *Butea frondosa*, q. v. Some is prepared from the kernels of *Areca Catechu*, q. v., and a kind called Gambir from the leaves of *Uncaria Gambir*, q. v.

Catechu is seen either in square or roundish pieces or balls, varying in colour, from a pale whitish or light reddish-brown to a dark brown colour; either earthy in texture, or lamellated, or presenting a smooth shining fracture. Some kinds are more friable than others; all are without smell; the taste is bitter, astringent, followed by a little sweetness. The pieces are generally of a darker colour externally than they are in the inside. Some of the kinds are covered with Rice husks; others are enveloped in leaves, which Dr. Pereira has ascertained to be those of *Nauclea Brunonis*, a native of the Malayan peninsula.

The *pale* variety is usually distinguished from the *dark*-coloured, and said to be imported from Calcutta; but we have obtained both kinds in the bazaars there, the pale being imported from the upper provinces, and the dark from Pegu and Singapore. The dark-brown Catechus are obtained from Bombay; but both kinds may no doubt be prepared from the same tree, as a greater degree of heat, or longer continued heat, and greater exposure to light, is said to produce the dark colour. The dark are heavier, more dense in texture, and have a resinous fracture.

The largest portion of good Catechu is taken up by water, especially when boiling, the infusion being of a light or reddish-brown colour, according to its strength: it reddens litmus, and is strongly astringent in taste. It yields a precipitate with the salts of Alumina, also with Acetate of Lead, and one of a blackish-green colour with the salts of the Sesquioxide of Iron. From forming a curdy precipitate with a solution of Gelatine, Catechu is applicable to the tanning of leather, for which it is now much employed.

Sir H. Davy, in analysing the Dark and Pale Catechu, or the Bombay and Bengal, as they were called, obtained from

	of Tannin	Extractive	Mucilage	Insol. residuum.		
Dark Catechu	109	68	13	10	=	200
Pale ,,	97	73	16	14	=	200

The Tannin of Catechu is very similar in properties to that obtained from Galls. The principle called Extractive by Sir H. Davy, has been since named *Catechine*, or *Catechuic acid.* This is most easily obtained by treating Gambir with cold water: the Tannin being dissolved, the insoluble residue is impure Catechine, which may be purified by solution in Alcohol and subsequent crystallization, when it looks like a white powder, but is in silky needles, and has something of a sweetish taste, producing a green colour with the salts of Iron. It is composed of $C_{15}H_6O_6$.

Tests. Catechu occurs of very different qualities, and is liable to be mixed with mechanical impurities. The L. P. states that Catechu is almost entirely soluble in boiling water, and that this liquid, when cooled, does not become blue on the addition of Iodide of Potassium and Nitric acid. (Test for starch.) If Ether be digested on 100 grs. of either kind of Catechu, so much ought to be dissolved, that 40 grs. of the dried ethereal extract will be soluble in cold water. (This is a measure of the amount of Tannin.) The E. C. states that the finest qualities yield to Sulphuric Ether 53, and the lowest qualities 28 per cent., of Tannin dried at 280°.

Action. Uses. Powerful Astringent. Applied externally, or taken internally.

D. gr. x.—gr. xxx. or more of the powder; or allow a piece of pale Catechu, as pleasanter tasted, to dissolve in the mouth; or soak a lump of Sugar in the Tinct. of Catechu, for relaxation of the throat, &c.

INFUSUM CATECHU (E.) COMPOSITUM, L. D. Infusion of Catechu.

Prep. L. Macerate for 1 hour in a covered vessel in boiling *Aq. dest.* Oj., *powdered Catechu* ʒvj., and bruised *Cinnamon* ʒj. Strain. E. D. Similar. The E. C. adds syrup.

Action. Uses. Powerful Astringent, in doses of f℥iß. three or four times a day.

TINCTURA CATECHU COMPOSITA, L. Tinct. Catechu, E. D. Compound Tincture of Catechu.

Prep. L. Macerate for 7 days *Catechu* in powder ℥iijß. bruised *Cinnamon* ℥ijß. in *Proof Spirit* Oij. Strain. E. D. Similar.

Action. Uses. As Proof Spirit dissolves both the astringent and resinoid principles, this Tincture is strongly astringent, and useful as an adjunct to Chalk Mixture, &c., in doses of fʒj.—fʒij.

ELECTUARIUM CATECHU, E. Elect. Catechu Compositum, D. Compound Catechu Confection.

Prep. E. Take *Catechu* ℥iv. *Kino* ℥iv. *Cinnamon* ℥j. *Nutmeg* ℥j. Pulverize, then mix *Opium* diffused in a little *Sherry Wine* ʒiß. and *Syrup of Red Roses* reduced to the consistence of Honey Oiß. Beat into a uniform mass. D. *Comp. Catechu powder* ℥v. is mixed with *simp. Syrup* f℥v.

Action. Uses. Aromatic Astringent, with gr. $2\frac{1}{4}$ of Opium in ℥j. E.—The D. preparation contains no opium.
D. ℈j.—ʒij.

Sub.-Ord. II.—Cæsalpineæ, or Cæsalpiniads, *Brown*.

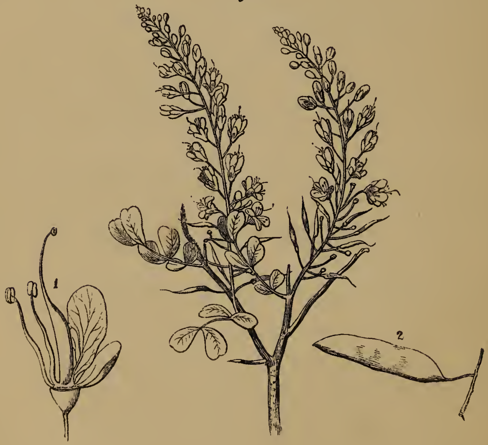
In this tribe the corolla is nearly regular, or sub-papilionaceous, of 5 free imbricate petals. Stamens 10, or fewer, usually free.

The Cæsalpineæ abound in tropical and warm parts of the world; a few, as Cercis Siliquastrum, spread into more northern latitudes. Some are highly ornamental. The wood of many is red-coloured and astringent. Hymenæa Courbaril yields a resin, the *Gum Anime* of the shops. The leaves and fruit of some are purgative, as of the Cassia Sennas and of the Tamarind.

Hæmatoxylum, L. E. D. Hæmatoxylon campechianum, *Linn.* Lignum; Wood, L. E. D. Logwood. *Decandria Monogynia*, Linn.

Logwood is noticed by Monardes for its medical uses; but it has also been long employed in the art of dyeing. It is a native of the coast of Campeachy, but is now common in the West Indies, as also in India.

Fig. 58.



A tree (fig. 58) of moderate size, stem generally crooked, furnished with spines in arid, but unarmed in moist situations. Leaves 2—4 from the same point, pinnate; leaflets 2 to 4 paired, obovate or obcordate. Flowers in racemes, shortly stalked, yellow. Sepals 5, united at the base into a permanent cup, the laminæ being purplish and deciduous. Petals 5, obovate, a little larger than the

sepals. Stamens 10, hairy at the base. Legume (2) small, compressed, lanceolate, pointed at each end, 2-seeded, sutures indehiscent, valves bursting longitudinally in the middle.—*Sloane*, Hist. 2, t. x. f. 1 to 4.

The sap-wood of this tree, being light-coloured, is rejected, but the interior red-coloured wood is imported in logs, chiefly for the use of the dyer. These are externally of a dark colour, internally yellowish-red. The wood is hard, close-grained, and tough; usually in chips. Sp. Gr. 1·057. It has a slight but rather pleasant smell when in mass, which is compared to that of Iris-root; the taste is slightly bitter and astringent, with a little sweetness. Both water and Alcohol take up its active principles; acids render its decoction of a brighter red, and throw down a slight precipitate. Alkalis produce a purplish colour. Alum, Acetate of Lead, and the salts of Iron, throw down precipitates, the last of a bluish-black colour; and Gelatine reddish-coloured flakes. Analysed by Chevreul, it yielded Volatile Oil, an Oleaginous or Resinous matter, a brown substance containing Tannin, Glutinous matter, several salts, and a peculiar azotized, crystalline colouring substance, *Hæmatine*, which is occasionally deposited in the form of crystals in the wood, and may sometimes be obtained by evaporating red ink. It has a sub-astringent and slightly bitter taste.

Action. Uses. Mild Astringent and Tonic.

DECOCTUM HÆMATOXYLI, L. E. D. Decoction of Logwood.

Prep. L. Boil *Logwood-chips* ℨx. in *Dist. water* Oiss. down to a pint, and strain. D. Twice as strong. E. ℥j. is boiled in Oj. down to f℥x., ℨj. of *Cinnamon powder* added, and the whole strained.

Action. Uses. Astringent: given in Diarrhœas in doses of f℥j.—f℥ij.

EXTRACTUM HÆMATOXYLI, L. E. Extract of Logwood.

Prep. L. Macerate *cut Logwood* ℔iiss. in *boiling Aq. dest.* Cij. for 24 hours. Then boil down to a gallon; strain the liquor while hot, and evaporate to a proper consistence. E. Similar. Some is imported.

Action. Uses. Astringent in doses of grs. x.—ʒss.

TAMARINDUS, L. E. D. Tamarindus indica, *Linn.* Fructûs Pulpa, L. Pulp of the Pods, E. D. Fruit of the Common Tamarind Tree. *Monadelphia Triandria*, Linn.

The Tamarind is a native of India, and has been long used there as an article of diet and in medicine. The Arabs, on becoming acquainted with it, called it *Tamr hindee*, that is, "the Indian Date," whence, no doubt, the Latin name is derived.

A lofty tree with crooked branches, remarkable for its light and elegant foliage. Leaves abruptly pinnate, with 10 to 15 pairs of leaflets, which are small, narrow, oblong, obtuse. Stipules small, deciduous. Flowers in lateral and terminal racemes, of a yellow colour variegated with red. Calyx turbinate, at the base, limb bilabiate, reflexed, upper lip tripartite, lower broad 2-toothed. Petals 3, unilateral, the middle cucullate. Stamens, 2—3 united together, and

fully developed, 7 very short and without anthers. Ovary stalked, style subulate, Legume pendulous, broad and thickish, more or less curved, having externally a hard but brittle scabrous rind, which does not separate into valves, but under it run some woody fibres, and there lies some acidulous reddish-brown pulp. Seeds from 3 to 12, covered by a membranous coat, flattened, bluntly 4-angled. smooth, hard and brown coloured, inserted into the convex side of the legume, There is no solid foundation for the distinction into two species; *T. orientalis* being supposed to be 6—12 seeded, and *T. occidentalis* 3—4 seeded.

Tamarinds are sometimes imported dried, as from India, where there are two varieties, one a dark and the other a light-coloured fruit. In the West Indies, the outer shell having been removed, they are preserved either between layers of moist sugar or in syrup. Preparations are also made from them with sugar in India, which are employed in making sherbets. They are also used in preserving fish, which is hence called Tamarind Fish. The proper officinal part is the pulp stored up between the seeds and husk.

Tamarinds have a powerful acid taste, but when preserved, they are sweet and acidulous, and then form a dark-coloured adhesive mass, containing pulp, stringy fibres, seeds, and sugar. Vauquelin, in one of the first analyses he published, found of Citric′ 9·4, Tartaric′ 1·55, Malic′ 0·45, Bitartrate of Potash 3·25, Sugar 12·5, Gum 4·7, Pectin 6·25, Parenchymatous fibre 34·35, with Water 27·55=100.

TAMARINDUS PRÆPARATUS, L., is directed to be made by boiling lb j of Tamarinds for four hours in water enough to cover them; then pressing the soft pulp, first through a fine sieve made of cane, afterwards through a fine hair sieve; and, lastly, evaporating it in a water bath to the consistence of a confection. By this means the finer parts of the pulp are separated from the woody fibre and other coarse ingredients.

Action. Uses. Refrigerant, Laxative. A Syrup of Tamarinds diluted with water makes an excellent refrigerant drink. An Infusion may be similarly used, as also Tamarind Whey, made by boiling Tamarind pulp ℥ij. in Milk Oij.

Off. Prep. Inf. Sennæ Comp., E. Confect. Sennæ, L. D. Confect. Cassiæ, L.

CASSIA, *Linn.* *Decand. Monog.* Linn.

Calyx of 5 sepals, which are united at the base, and more or less unequal. Petals 5, also unequal. Stamens 10, free, the 3 upper short, rarely fertile; the 7 others bearing anthers, but often unequal. Anthers opening at the apex by 2 pores. Ovary stalked, usually arched. Legume usually compressed, many-seeded.—Trees, shrubs, or herbs, of tropical countries. Leaves simply and abruptly pinnated, leaflets opposite. Petioles often glandular. Flowers yellow.

CASSIA, L. Cassia Fistula, *Linn.* Fructus, L. Pulp of the Pods, E. Cassia Pulp. Purging Cassia.

This has been unfortunately named, as it is constantly confounded with the Cassia yielded by the family of Laurels, with which the pre-

sent product has nothing to do. The plant is a native of India, where it is constantly employed in medicine by the natives, and thus became known to the Arabs. The tree has been introduced into the West Indies, whence Cassia pods are now imported, as well as from India and the north of Africa.*

One of the most showy of trees, having something of the foliage of the Ash, with the inflorescence of the Laburnum. Leaves from 12 to 18 inches long, with from 4 to 8 pair of opposite, ovate, rather pointed leaflets, smooth on both sides, of a light green colour, from 2 to 6 inches long and 1 to 3 broad. Stipules minute. Petioles round, without glands. Racemes 1 to 2 feet long pendulous, without bracts. "The three lower filaments longer than the others, with oblong anthers opening by two lines in the face, the other 7 clavate, with pores at thesmall end." (Lindley.) Ovary slender, smooth, 1-celled, with numerous seeds, and without any transverse separations. Legumes cylindrical, 1 to 2 feet long, smooth, somewhat obtuse, indehiscent, marked externally with 3 longitudinal bands, one being opposite to the two others, divided into a number of spurious cells by transverse partitions. Seed one in each cell, surrounded by a soft blackish-coloured pulp. On account of this peculiarity of the legume, this plant is sometimes but unnecessarily placed in a separate genus, *Cathartocarpus*.

The pods being officinal on account of the pulp, those are to be chosen which are heavy, and in which the seeds do not rattle. The pulp is of a blackish colour, viscid, with a rather mawkish sweet taste, and a slight sickly odour.

CASSIA PRÆPARATA, L., is made by macerating for six hours lbj of Cassia pods, broken lengthwise, in enough dist. water to cover them, frequently stirring; then straining the pulp through a hair sieve, and evaporating in a water-bath to the consistence of a confection.

Soubeiran states that four ounces of pod give one ounce of pulp. This, analysed by Vauquelin, yielded Sugar, Gum, Extractive, Vegetable Jelly, Gluten, Parenchyma, and Water. M. Henry states that the Sugar possesses the nauseous taste peculiar to the pulp, and he has announced the presence of a principle having many of the properties of Tannin.

Action. Uses. Laxative; in large doses, Purgative.

D. ʒj.—℥ij. as a laxative; but apt to create flatulence, &c. Usually given in combination, as in Conf. Sennæ, and in

CONFECTIO CASSIÆ, L. Confection of Cassia.

Prep. Dissolve *Manna* ℥ij. in *Syrup of Rose* f℥viij., add *Prepared Cassia* ℥vj. and *Prepared Tamarind* ℥j. evaporate to a proper consistence.

Action. Uses. Laxative in doses of ʒij.—℥j. for adults.

* According to Dr. Landerer, the Cassia Fistula of Egypt grows in the neighbourhood of Aphti, about two days' journey from Alexandria. There is here a small forest of these trees, which are thought to be of great age. He states that the Egyptians prefer the unripe fruit.

SENNA, L. E. D. Folia. *Senna Alexandrina*, produced by Cassia officinalis and C. obovata; *Senna Indica*, by C. officinalis, L. Alexandrian Senna, produced by C. acutifolia; and Tinnivelly Senna, by C. elongata, D. Senna-leaves.

Senna has been distinctly known only since the time of the Arabs; but they refer to the legumes only, though the leaves have long been employed in the East. There is still some uncertainty respecting the species of Cassia which yield the different commercial varieties. This is owing partly to all the Senna countries not having been thoroughly explored, and partly to some species having been formed from imperfect specimens, and others from leaves collected out of different samples of the Sennas of commerce. The following species seem to be clearly distinct. The Author has changed the name of Forskal's *C. lanceolata*, in consequence of the great confusion which has arisen from this name having been applied by so many authors to the sharp-leaved Senna, which is imported in such large quantities both from Arabia and Egypt, and which is now restored to its old name, *C. officinalis.*

1. CASSIA OFFICINALIS (C. lanceolata; P. L. 1836). Fig. 59, taken from the Author's "Illustrations of Himalayan Botany," t. 37. This is a bushy annual, of about 2 to 3 feet in height, extremely leafy, and of most luxuriant inflorescence in a cultivated state. The stems are erect, round, smooth, a little flexuose towards the apex. The leaves alternate, abruptly pinnate. The leaflets 5 to 8 pairs, with short petioles, ovate-acute in the lower and lanceolate-acute in the upper parts of the plant, "slightly mucronulate, smooth above, rather downy beneath (especially in young leaves), with the veins turning inwards and forming a flexuose intra-marginal line; petioles without glands; stipules softly spinescent, semihastate, spreading, minute." Racemes axillary and terminal, erect, rather longer than the leaves. Ovary linear, downy, falcate, with a smooth recurved style. Legumes (3) pendulous, membranous, flat, only slightly protuberant over the seeds, oblong, sometimes elliptical, nearly straight, with the upper margin a little curved, tapering abruptly towards the base, and rounded at the apex, of a brown colour, containing from 5 to 8 white rugose seeds (2). These are figured by Gærtner, ii. t. 146. It is probably the *Cassia medica* of Forsk. p. cxi., and agrees with his specimen of "Senna Meccæ Lohajæ inveniebatur foliis 5—7 jugis, lineari-lanceolatis," p. 85, of which Forskal states large quantities are yearly exported from the district of Abu-arisch to Jidda. (*C. lenitiva* and *medicinalis* of Bischoff.) This species includes:

a. C. elongata, a name applied to the form of *Tinnivelly Senna*, cultivated by Mr. Hughes in the south of India; also that cultivated by the Author at Saharunpore, C. lanceolata, Royle, Him. Bot. t. 37, and by Dr. Wight near Madras. v. fig. 60, B. and spec. in Brit. Mus. It is the Cassia officinalis of Gært. and Roxburgh, Fl. Ind. ii. p. 346. It is cultivated by Dr. Gibson, near Poona.

Dr. Burns writes that he has found the lanceolate Senna wild near Kaira in Guzerat. His cultivated specimens, if picked, would form good Senna.

b. C. lanceolata of most authors, C. acutifolia, Hayne ix. t. 41. Nees and Eberm. t. 345. St. and Church. Pl. 30, as C. Senna. This represents the form of *Alexandrian Senna*, v. 60, A., (a small leaf), and specimen in Brit. Mus. from Senaar. (*Kotschy.*) It is found in the valleys of the desert to the south and east of Syene or Assouan, and collected for the trade to Cairo, forming 3-5ths of Alexandrian Senna.

c. C. acutifolia, called of Delile, Esenbeck, and Eberm. t. 346 (fig. 60, C.) The leaflets are narrower and more tapering towards the apex than the foregoing,

as might be expected in a poorer soil and drier climate. This is very much the form of the *Bombay Senna*. Some of the Indian specimens in Dr. Rottler's Herbarium closely resemble this variety; also African specimens from Tajowra to the south of the Straits of Bab-el-Mandeb.

Fig. 59.

Judging from the best botanical specimens in London, the Author is unable to distinguish these three kinds by any permanent characters; neither dried Senna-leaves cultivated at Saharunpore from good specimens of *Bombay Senna* (that is, ordinary Indian Senna) imported here from India; nor these from *Suna Mukki* sent him by D. Malcolmson from Aden, and which he states are "the produce of Africa, but in appearance exactly resemble the Arabian Suna. In the market both are sold as one kind, and bring the same price."

2. C. OVATA of Merat, Dict. de Mat. Med. b. 613. *C. æthiopica*, Guibourt. This may be a distinct species, as it is said to have a gland at the base of the petiole and another between each pair of leaflets. The leaflets are in 3 to 5 pairs, exactly oval-acute, slightly pubescent below; the follicles are thin, pale yellow-coloured, 1-3rd smaller than those of *C. obovata*. It is said to be found both in Nubia and Fezzan, and to furnish exclusively the Senna of Tripoli, Séné de Tripoli. It is extremely like a variety of *C. officinalis*. The figure of C. Senna in Stevenson and Churchill, Med. Bot. t. 30, quoted by Dr. Pereira as representing this plant, is referred to by Dr. Lindley as a good representation of C. acutifolia of Delile. But Merat and De Lens say of it: "Nous ne le connaissons que par les feuilles et les fruits qu'on en voit dans la commerce." M. Guibourt calls it *C. æthiopica;* but instead of referring to *C. lanceolata* of Colladon, Pl. xv. f. e. as representing this species, he says that it is exactly represented by the Séné de Nubie of Nectoux, pl. 2.

3. C. FORSKALII (C. lanceolata, *Forsk.* and *Lindley,* Fl. Med. p. 259). Leaflets in 4 or 5 pairs, never more; oblong and either acute or obtuse, not at all ovate or lanceolate, and perfectly free from downiness even when young; the petioles have *constantly* a small round brown gland a little above the base. The pods are erect, oblong, tapering to the base, obtuse, turgid, mucronate, rather falcate, especially when young, at which time they are sparingly covered with coarse scattered hairs. (Lindl. *l. c.*) Collected by Dr. S. Fischer in Palm-grounds in the valley of Fatmé, flowering at the end of February. Forskal describes this as being distinguished "glandulâ supra basin petioli." It was found by him at

Surdud and about Mor. It is called *Suna* by the Arabs, and probably yields some of the Arabian Senna of commerce. Batka supposes this plant to be C. ligustrina, and states that it yields none of the officinal Senna.

4. C. OBOVATA, *Colladon.* Hayne. ix. 42. Nees and Eberm. 347. Diffuse herbaceous plant. Leaves equally pinnate, glandless. Leaflets 4—6 pairs (somewhat villous, Roxb.) obovate, obtuse, but slightly mucronate, unequal at the base, the terminal pair more cuneate and larger. Stipules triangular, narrow, and tapering, rather stiff and spreading. Flowers yellow, in racemes. Bracts ovate, cordate, acuminate, concave, single-flowered. Legumes broad, membranous, smooth, lunate in shape, rounded at each end, with an elevated crest over each side on both valves, so as to form an interrupted ridge along the middle of each valve. Seeds 6 to 8, wedge-shaped, rugose as in C. officinalis.— A native of Africa, from Senegal (*Fl. de Senegambie*) to the Nile; found in Fezzan by Dr. Oudney (*R. Brown*), in Egypt from Cairo to Assouan, Nubia; found in the Adel country near Sultalli (*Mission to Abyssinia*); Desert of Suez; Syria; dry parts of India, as Kaira (*Burns*); Guzerat, Dekkan (*Col. Sykes*), near Delhi, and Valley of Rungush, near Peshawar (*Falconer*); high dry uncultivated lands of Mysore (*Roxburgh. Wight*). It has been cultivated in Italy (*Séné d'Italie*), and forms 3-10ths of Alexandrian Senna.

This species is very distinct, in its obtuse obovate leaves and crested legumes, from the preceding acute-leaved species. *C. obtusa* Roxb. was probably described from young legumes, as the author, like Dr. Lindley, has compared good specimens from Mysore with others from Africa. The *obtusata* (fig. 60, H.) of Hayne does not seem to differ sufficiently from his *C. obovata* (fig. 60, G.) It is possible, however, that there are two very similar species in Africa. Dr. Wallich was of opinion that the Indian plant was distinct from the Egyptian, and proposed calling it Cassia Burmanni. Mr. H. Grant, late of the India House, has favoured the author with a specimen in flower, collected by him in February at Philæ, which has upon it *both* obovate (H.) leaflets and some which are ovate and acute (G.)! Lieut. Wellsted's collection contains a specimen from the coast of Arabia, of which the leaflets are obtuse, elliptic, and hairy. This is perhaps the *C. tomentosa* of Delile, *C. Schimperi* of Steudal, found by Batka in Mecca Senna.

The Sennas of commerce may be arranged as follows.

1. SENNA INDICA. *Tinnivelly Senna* was first cultivated in the district of that name, in 12° of N. lat. by the late Mr. Hughes, from seed probably obtained from Arabia, or picked out of *Suna Mukki*, as was done by the author when he cultivated Senna at Saharunpore. (*v.* Himal. Bot. p. 186, t. 37, and Trans. Med. Soc. of Calcutta, v. p. 433.) The author also grew Senna from Tinnivelly seed sent out to him by Sir C. afterwards Lord Metcalfe; but he did not find the smallest difference between the two when grown in the same situation. The Tinnivelly Senna is well-grown and carefully picked; the leaflets are of a fine rather lively green colour; thin, but large, being from one to two inches in length, truly lanceolate. "It is of a light pea-green colour, very thin and membranous, flexible, having a sour vinegar-like smell, as if it had undergone the acetous fermentation while drying." (Wight.) It sustains great loss of weight in keeping. This kind is "highly esteemed in this country, and is quickly displacing all the other sorts in this (Edinburgh) and many other cities in Britain." (Christison.) Dr. A. T. Thomson says that it is mild in operation, certain as a purgative, and operates without griping. It is now cultivated by Mr. Hughes' successor.

Saharunpore Senna, the same kind of Senna cultivated at Saharun-

pore, differed only in the leaflets being smaller, as might be expected from the more northern latitude (30°). These the author prescribed in the hospitals at Saharunpore, and found them effective as a purge, and operating without producing inconvenient nausea or griping. Mr. Twining, after trying them in forty-five cases in the General Hospital at Calcutta, says, in his report to the Medical Board: "From these trials, I am disposed to consider the Senna now under trial equal to the best I have ever seen."

Madras Senna. Senna is now imported also from Madras, the produce of that Presidency. In 1843–44, I find 11,536 lbs. were exported to this country, having been previously imported into Madras from Tinnivelly, where it is cultivated by the natives, and is of the same nature as Mr. Hughes' Senna, though not so well grown nor so carefully picked. Dr. Christison says of it, the leaflets are longer than those of Bombay Senna, and not so taper-pointed, but otherwise differ only in being better preserved, and, being more active, are more esteemed.

Dr. Searle, in a communication to the India House, says of this Senna, "that now furnished to the profession by the Madras Government is in my experience quite as good as the Alexandrian," "every leaf of the Indian being of the genuine spear-shaped species."

These three kinds of Indian Senna may be referred to the variety *elongata* of *C. officinalis*, a peculiarity in form which probably depends upon the conditions of cultivation.

2. Senna Arabica *v.* Africana. *Bombay* or *Common Indian Senna*, *Suna Mukki* of the natives, is first imported into Bombay from the Arabian Gulf:

316,728 lbs. in 1837–38. 570,426 lbs. in 1838–39.
Re-exported to Great Britain, 262,284 lbs. in 1838–39.

That this Senna forms a large, if not the largest proportion of what is consumed in this country, is not only evident from the above importation, but also from a comparison with the whole quantity of the other Sennas imported, as given by Dr. Pereira.

	1838.	1839.
From East Indies	72,576 lbs.	110,409 lbs.
From other places	69,538 „	63,766 „

Some of this Senna is no doubt produced in Africa, as stated above by Dr. Malcolmson; a good deal of it in Arabia, probably by *Cassia officinalis*, (var. *acutifolia* ?), and some perhaps by *C. Forskalii.* The leaflets are thin, lanceolate, usually entire, about an inch or an inch and a half in length, narrower than either the Tinnivelly or Saharunpore Senna, probably from growing in a poorer soil and drier climate. They are of a pale-green colour, often with dark brown-coloured leaflets intermixed, also some pods, and many leafstalks, with occasionally other impurities. The better specimens of this Senna are,

however, of excellent quality, and its commercial and medical value would be much increased, if the finest leaflets were picked out. It is in constant use in hospital practice in India, and generally highly approved of. The author prefers it for all purposes to the following kind as found in commerce.

3. Senna Alexandrina. *Alexandrian Senna* is an excellent kind, when the genuine lance-shaped leaflets have been picked out; but that commonly employed in this country is a mixed and very impure kind, being made up of the leaflets, much broken, of *C. officinalis* (var. *lanceolata*) and of *C. obovata*, with some pods and broken leaf-stalks, and also with leaves of other plants. It should be used only after having been carefully picked, as directed in the E. P. Picked Alexandrian Senna is of a pale green colour, with a faint smell. The leaflets are broad-lanceolate, the two sides unequal; they are thicker and shorter than the Indian Sennas.

The lanceolate Senna of Upper Egypt, Nubia, and Senaar, yields two crops annually, the plants being cut down in spring and autumn, and dried in the sun; then the leaves are stripped off, packed in bales, sent to several *entrepôts*, and finally to Boulac in the vicinity of Cairo. Of the lanceolate Senna *five* parts are here mixed with *three* parts of the leaflets of *C. obovata*, brought from other parts of Egypt and even from Syria, and also with *two* parts of the leaves of *Cynanchum Argel.* This mixed Senna is that exported from Alexandria. On the Continent a further addition is made of the leaves of *Colutea arborescens* and of *Coriaria myrtifolia.*

Dr. Pereira states that, "under the name of *heavy senna* he has met with *argel* leaves, which were sold at a higher price than ordinary senna," and Dr. Christison mentions what indeed may often be seen, that is, Argel leaves left intermixed even in what is called Picked Alexandrian Senna. This Senna is often called "Séné de la Palthe."

4. Tripoli Senna, is brought from Fezzan to Tripoli. This has the general appearance of Alexandrian Senna, but though it is a more pure Senna it is less esteemed, probably because the leaflets are more broken down, and all the leaf-stalks have not been removed. The leaflets are shorter and less pointed than in lanceolate Senna—indeed, more ovate; hence this Senna is said to be produced by *C. ovata* (C. æthiopica); but it also contains leaflets of *C. obovata*, which species was found in Fezzan by Dr. Oudney.

5. Aleppo Senna is now seldom imported into this country. It consists of the leaflets of *C. obovata*, as do some other kinds, such as Italian Senna. Dr. Ainslie says that the *obovate* is the only kind of Senna met with in India, meaning the Peninsula of India; for it is not met with in the Bengal Presidency; nor, according to Dr. Searle, is it used in that of Madras at the present day. It is less effective as a purgative, and apt to create nausea and griping.

Adulteration. Commercial Senna is prepared for use by picking out

the leaflets, and rejecting the leaf-stalks, with extraneous matters, as dust, date-stones, &c., as well as the leaves of other plants. The legumes, however, possess the cathartic properties of the leaves to a considerable extent, and were alone used by the original Arabs; and there is no reason to believe that the stalks are inert. The most important adulterations are, however, the leaves of other plants. Those of the *Argel* (D.) may be distinguished by being lanceolate, equal on the two sides of the midrib, thick, leathery, and paler. They operate very dubiously as a cathartic, but occasion griping and protracted sickness (*c.*). Those of *Tephrosia Apollinea* (F.) are obovate downy,

Fig. 60.

A. Cassia officinalis *v.* lanceolata. B. Tinnivelly Senna. C. C. acutifolia. D. Cynanchum Argel. E. Coriaria myrtifolia. F. Tephrosia Apollinea. G. C. obovata. H. C. obtusata.

and the veins proceed transversely from the midrib to each margin of the leaf without forming a marginal vein. The leaves of *Colutea arborescens*, or Bladder Senna, are ovate, but equal at the base. Those of *Coriaria myrtifolia* (E.) are astringent, usually broken down, and marked on each side of the midrib with a strong lateral nerve. As the systematic adulteration of Senna in Egypt with the leaves of other plants is objectionable, and has been so noticed by the Pharmaceutical Society, the most efficient method of stopping it would be to purchase

only the pure African and Arabian Sennas which come to us by Bombay, instead of (unless it has been picked) that which is called Alexandrian from its place of export (*v.* P. J. ii. p. 63). In India a good substitute for Senna is afforded by *Rae Suna.* (*v.* COMPOSITÆ.)

Prop. Senna has a faint sickly smell; its taste is slightly mucilaginous, bitter, and nauseous. Alexandrian Senna, analysed by MM. Lassaigne and Feneulle, yielded Mucilage, Albumen, Chlorophyll, Fixed Oil, a little Volatile Oil, yellow Colouring Matter, and some Salts. Its properties are supposed by some to depend upon *Cathartine*, which is described to be a deliquescent uncrystallizable matter. The pods are composed of the same principles, with the exception of the Chlorophyll. M. Heberlein has lately experimented upon this Cathartine, and describes it as a dark-brown clear extract, with an unpleasant odour, and an acidulous, bitter, also unpleasant taste ; perfectly soluble both in Alcohol and water. He considers it to be merely an extract, containing a free Vegetable acid, a Salt with an alkaline base, and a Brown Bitter Extractive. He further found that it did not contain the purgative principle of the Senna. gr. v. from ʒij. of Senna-leaves, and even gr. x., given to patients, were inefficacious ; also four doses of ℈j. each, taken by himself at intervals of an hour and a half, were without effect.

The active principles of Senna are extracted both by rectified and by proof Spirit, and by cold and hot water; but long boiling injures its properties as a medicine. A very useful set of experiments has been made by Mr. Deane (P. J. iv. 61), from which he finds that though the best result was obtained by macerating Senna in a weak Spirit, yet that cold water extracts the soluble and active portions, nearly if not quite as well as hot water ; and that picked Alexandrian Senna of the best quality is superior to all the others in the quantity of extract it yields. Of the East Indian, that from Tinnivelly is best; and the common East Indian is better than small Alexandrian. But it has not been proved that the purgative property is in proportion to this Extract. He found that Senna 7½ oz. troy were completely exhausted by Dil. Spirit (1 part Spirit to 5 of water) 20 fl. oz., and the product four times the strength of the Inf. Sennæ L. P.*

Action. Uses. Purgative ; safe and efficient, acting chiefly on the small intestines, and producing copious loose evacuations, in doses of ʒß.—ʒij. as in some of the following forms, or with Bohea Tea (Paris), or with Coffee, as in the French *Café au Séné.*

INFUSUM SENNÆ COMPOSITUM, L. D. Infusum Sennæ, E. Infusion of Senna.

Prep. L. Macerate for an hour in a covered vessel *Senna* ℥xv. bruised *Ginger*

* On the contrary, M. Heberlein states that spirit is a most inefficient solvent of the active principle of Senna; and that leaves which have been exhausted by this menstruum are still most energetic in producing purging! (P. J. viii. 400.)

℈iv. in boiling *Aq. dest.* Oj. and strain. E. D. similar; E. prep. weaker, D. ½ as strong as L.

This infusion has the odour and taste of Senna, and is of a clear brown colour. It is much employed as a purgative in doses of f℥iss.—f℥iij., often in combination with a saline purgative, and a warm or purgative Tincture, forming the common *Black Dose.*

INFUSUM SENNÆ COMPOSITUM, E. Compound Infusion of Senna of the E. P.

Prep. Infuse for 4 hours, occasionally stirring, in a covered vessel not glazed with lead, *Senna* ʒj. *Tamarinds* ʒj. bruised *Coriander Seeds* ʒj. *Muscovado* or *Brown Sugar* ℥ss. boiling *Aq.* f℥viij.; strain through linen or calico. The same may be made with 2 or 3 times the quantity of Senna.

This infusion is sometimes preferred on account of the combination of Aromatics and Sugar, with the cooling effects of the Tamarinds, &c. Acts as an effective purgative in doses of f℥iss.—f℥iij.

ENEMA CATHARTICUM, E. D. Cathartic Enema.

Prep. E. Infuse for 1 hour in boiling *Aq.* f℥xvj. *Senna* ℥ss. then dissolve *Sulph. Magnesia* ℥ss. *Sugar* ℥j.; add *Olive Oil* ℥j. and mix by agitation.

D. Dissolve *Sulph. Magnesia* ℥j. in *Mucilage of Barley* f℥xvj. and add *Olive Oil* f℥j.

Employed as a laxative Enema.

TINCTURA SENNÆ COMPOSITA, L. E. D. Comp. Tinct. of Senna.

Prep. L. Macerate for 7 days *Senna* ℥iijss., bruised *Caraways* ʒiijss., bruised *Cardamoms* ʒj., *Raisins* (stoned) ℥v, in *Proof Spirit* Oij.; strain. The E. C. order also some Jalap, Sugar, and Coriander-seed, and direct that the Tincture may better be prepared by percolation. If Alexand. Senna be used, it is first to be freed of Cynanchum leaves by picking. D. Similar to L.; no raisins.

A warm and stimulant purgative. That of the E. P. is made more effective by the Jalap, and by the corrective effects of the Sugar. Usually prescribed as an adjunct to the Infusion, in doses of fʒj., sometimes alone in doses of f℥ss.

SYRUPUS SENNÆ, L. E. Syrup of Senna.

Prep. L. Macerate *Senna* ℥iijss. and *bruised Fennel-seed* ʒx. in *boiling dist. water* Oj. for 6 hours, with a gentle heat; strongly press out the liquor through linen, strain, and mix with it *Manna* ℥iij. Evaporate *Treacle* ℔iij. in a water bath until some part of it most remote from the fire almost concretes, and to it while hot add the liquor, stirring diligently until they are well mixed. E. Similar. The old L. formula has been altered in imitation of the directions of the E. C., as recommended by Dr. Christison.

Both preparations have scarcely the taste of Senna, cause little sickness or griping, and are effective as purgatives. A "Concentrated Syrup of Senna" has for some time been prepared in the metropolis. The following, or "Fluid Extract of Senna," is strongly recommended

by Dr. Christison (*v.* P. J. iii. 115 and 248), and is prepared by several druggists.

"Take of *Tinnivelly Senna* ℔xv. avoirdupois, and exhaust it with boiling water by displacement; (about 4 times its weight of water is sufficient). Concentrate the infusion in vacuo to ℔x.; dissolve it in *Treacle* ℔vj. previously concentrated over the vapour-bath till a little of it becomes nearly dry on cooling; add of *Rectified Spirit* (Sp. Gr. ·835) f℥xxiv.; and, if necessary, add *water* to make *fifteen pints.* Every f℥. will correspond to Senna ℥j. avoirdupois.

D. fℨij. for an adult. It tastes like treacle, the feeble mawkish one of Senna being covered; and it operates usually without producing either nausea or griping. Dr. C. informed the author, when in London, and again by letter in July, 1842, that a nobleman who had been in the habit of taking this Syrup made from Tinnivelly Senna, immediately discovered when the Alexandrian had been used, in consequence of the severe griping and its ineffectual teasing effect as a purgative, though taken in the same doses. There can be no doubt of the superiority of the Tinnivelly and other pure Sennas.

CONFECTIO SENNÆ, L. D. Electuarium Sennæ, E. Confection of Senna.

Prep. L. Rub together *Senna* ℥viij. and *Coriander* ℥iv. Pass through a sieve ℥x. of the powder. Boil with *Aq.* Oiij. *Figs* ℔j. and *fresh bruised Liquorice* ℥iij. down to one-half. Express, strain, and evaporate in water-bath till f℥xxiv. remain. In this dissolve *Sugar* ℔ijß. and make a syrup; rub in gradually *Prepared Prunes, Cassia,* and *Tamarinds,* āā ℔ß.; then throw in the sifted powder, and mix. E. D. Similar in strength to L. E. orders no Cassia or Tamarinds; D. no Cassia, Figs, or Liquorice, and adds some *oil of Caraway.*

Action. Uses. A mild but useful purgative in doses of ℨj.—ℨiv.

The bark of the ANDIRA INERMIS, or Cabbage Tree, a native of the West Indies, has been used in medicine for its anthelmintic and emetic properties. It was formerly officinal in the D. P.

COPAIBA, L. E. D. Oleo-resina ex inciso trunco fusa: Copaifera multijuga, *Hayne,* et aliæ species, L. Fluid-resinous exudation of several species of Copaifera, E. Balsam of C. officinalis, and various other species, D. Copaiva Balsam.

Copaiba was first described by Marcgraaf and Piso in 1648; but the species intended is uncertain, as the latter gives no figure, and the former only one of the fruit (supposed by some to be that of *Copaifera bijuga,* Willd). Jacquin, in 1763, described a species of Copaifera from Martinique, which he named *C. officinalis,* and which probably yields the little Copaiba obtained from the West Indies. It is quoted by the D. C. It has, however, been ascertained that several species yield the Copaiba of commerce. The Wood-Oil of some species of *Dipterocarpus* yields a substance closely resembling Copaiba.

The balsam of Copaiba of commerce is chiefly obtained from the Brazils; a very little being imported from Guiana and the West Indian islands. It is yielded by several species.

Copaifera, *Linn.* *Decand. Monog.* Linn.

Calyx without bracts, 4-parted, divisions small, spreading; corolla none; stamens 10, separate, nearly equal, declinate; ovary compressed with two ovules; fruit a legume, stalked, obliquely elliptical, coriaceous, somewhat compressed, 2-valved, 1-seeded; seed elliptical, enclosed in a 1-sided aril; embryo straight; radicle somewhat lateral.—Trees or shrubs of tropical America. Leaves alternate, equally or unequally pinnate; leaflets opposite or alternate, coriaceous, somewhat unequal, ovate, either dotted or not. (*Lindl.*). Stipules generally wanting; bracts caducous; flowers in compound axillary and terminal spikes.

Fig. 61.

1. *C. Langsdorffii*, Desf. (*v.* fig. 61). Leaflets 3—5 pairs, equal-sided, obtuse, with pellucid dots; the leaves ovate, the upper elliptical; petioles and peduncles slightly downy.—San Paulo and Minas.

2. *C. multijuga*, Hayne. Leaves equally pinnated; leaflets 6—10 pairs, somewhat incurved, unequal-sided, with a long tapering point, and pellucid dots,—the lower ovate-oblong, the upper lanceolate.—Para.

3. C. coriacea, *Mart.*	San Paulo and Minas.	6. C. nitida, *Mart.*	Minas Geraes, and Goyaz.
4. C. guianensis, *Desf.*	Rio Negro, Para.	7. C. Beyrichii, *Hayne.*	Rio and Estrella.
5. C. Martii, *Hayne.*	Para, Maranhao.	8. C. officinalis, *Linn.* C. Jacquini, *Desf.*	West Indies, and Venezuela.

Copaiva, though usually called a Balsam, is not correctly so named, as it contains no Benzoic (or Cinnamic) acid. It is an Oleo-Resin,

which varies more or less in colour, odour, specific gravity, and medical virtues, according to the species from which it is obtained. (*Martius.*) The species 1 and 3 yield the best Copaiva in the district of San Paulo, 4 in Guiana, 2 and 5 in Para, 6 in Minas Geraes, 7 in the mountains of Estrella and at Rio, 8 in Venezuela and the West Indies. Other species are productive, and no doubt yield some of the Copaiva of commerce. Most of the balsam, however, is obtained from Para and Maranham; and this is probably yielded mainly by *C. multijuga*, as stated in the L. P. Dr. Christison mentions Copaiva sent from British Guiana, obtained from plants growing further north than the above (except No. 8), and near the Orinoco, the species of which botanists have not yet determined. The species growing in the hot and moist parts of Brazil form large trees, and yield very fine Copaiva; those of the drier and interior districts, as Minas Geraes, &c., are shrubby in nature, and yield less, but also a more resinous balsam; that of the West Indies is darker-coloured, turbid, more acrid in taste, and smells more of turpentine. It is in all these places obtained by making deep incisions into the trunk of the trees, chiefly at the end of the rainy season, when it flows out so abundantly, that 12 lbs. are said by Piso to be obtained in a few hours.

Prop. Balsam of Copaiva is a liquid (Sp. Gr. 0·95) of an oily consistence, transparent, of a pale straw-colour, of a strong odour, and disagreeable, nauseous, acrid taste. It becomes more dense and darker-coloured if kept exposed to the air. It is soluble in Alcohol, Ether, and Oils; but, like other Oleo-Resins, insoluble in water. With alkalis it forms soaps, which are precipitated when much diluted with water. Analysed by Stolze and Gerber, it yielded of Volatile Oil from 32 to 34 parts, Yellow Resin (*Copaivic acid*) 38 to 52, Viscid Resin 1·65 to 2·13, the rest being water and loss in 100 parts. The *Volatile Oil* may be separated by distillation with water. (*v.* Oleum Copaibæ.) The Resin which remains consists of two parts: one, *Copaivic acid*, hard, brittle, and crystallizable, having an acid reaction on Litmus, and forming compounds with bases: like Colophane or Pinic acid, it consists of $C_{40} H_{32} O_4$. The other, *soft*, *brown*, or *viscid Resin*, which is more abundant in old than in fresh Copaiva, has little affinity for bases, and may be separated from the other by being insoluble in Naphtha.*

Tests. The E. C. characterize Copaiva as "Transparent: free of Turpentine odour when heated: soluble in two parts of Alcohol: it dissolves a fourth of its weight of Carbonate of Magnesia, with the aid of a gentle heat, and continues translucent." An inferior kind, or

* The balsam usually met with forms a clear solution with solutions of Potash or Ammonia, and is readily soluble in Alcohol. But in 1849 M. Possett described a new variety of Copaiva, imported also from the Brazils, which would not mix with alkaline solutions, and was imperfectly soluble in Alcohol. It possessed the peculiar odour and taste, and the external characters, of good Copaiva.

some adulterated with Turpentine or fixed Oils, is occasionally sold. A greasy spot will be left, if any fatty oil is present, when a little is dropped on bibulous paper. Many inferior kinds are sold.

Action. Uses. Stimulant of Mucous Membranes, especially of the Urinary passages. In large doses, Cathartic and Diuretic. Diminishes Mucous discharges, as of Gonorrhœa, &c.

D. ♏xv.—fʒß. or even fʒj. two or three times a day, swimming on some fluid, or made into an emulsion; or in capsules, where the Copaiva is enclosed in a thin layer of Gelatine; or in the form of pill, with $\frac{1}{16}$ of Magnesia, as in the U. S. P.

OLEUM COPAIBÆ, L. E. Volatile Oil of Copaiva.

Prep. E. Distil *Copaiva* f℥j. with *water* Ojß. and separate the Oil.

Action. Uses. This oil is colourless, but acrid in taste, with a strong odour of Copaiva, soluble in Alcohol, Ether, &c. It consists, like Oil of Turpentine, of $C_{10}H_8$. It is preferred by many to every other form of Copaiva, in doses of ♏x.—♏xxx.

Sub.-Ord. III.—PAPILIONACEÆ, *Linn. Nat. Ord.* Papilionads.

The corolla is irregular, papilionaceous; of 5 segments, the 2 upper united, the lowest keeled. Stamens 10; monadelphous; or diadelphous, 9 united in a bundle, and 1 alone.

The Papilionaceæ may be distinguished by their irregular flowers, number and insertion of the stamens, and by the leguminous fruit, as well as by their habit; but the most doubtful may be distinguished from Rosaceous flowers by the odd segment of the calyx being anterior. Papilionaceæ are found in all parts of the world: their geographical distribution is best studied in their several tribes. Uses various.

BALSAMUM PERUVIANUM, L. E. Balsamum ex inciso trunco fusum: Myrospermi species incertæ, L. Fluid Balsamic Exudation of Myrospermum Peruiferum, *Dec.* E. Balsam of Peru.

BALSAMUM TOLUTANUM, L. E. D. Myrospermum Toluiferum, *Ach. Rich.* Balsamum ex inciso trunco fusum, concretum, L. Concrete Balsamic Exudation, E. D. Balsam of Tolu.

The Balsams of Peru and Tolu were first made known by Monardes in the year 1580. Mutis sent a branch in flower of the tree producing the first in 1781 to the younger Linnæus.

Balsam of Tolu has been long supposed, as stated by Ruiz, to be produced by the same tree. Miller having, however, grown it from seeds sent him from the province of Tolu behind Carthagena, considered it distinct, and continued to call it *Toluifera Balsamum.* Collected by Humboldt and Bonpland, it was described by Kunth as *Myroxylon Toluiferum.*

Ach. Richard, having examined the characters of these species, finds them all to belong to the genus *Myrospermum* of Jacquin, in which they have been continued by other botanists.

Thus the tree which yields Balsam of Tolu is known; but that which produces the analogous Balsam of Peru is hardly yet decided.

MYROSPERMUM, *Jacquin. Decand. Monog.* Linn.

Calyx campanulate, slightly 5-toothed; petals 5, subpapilionaceous, the upper largest; stamens 10, free; ovary stipitate, oblong, membranous, with 2—6 ovules, terminated with a lateral filiform style; legume with a winged stalk, which is very broad at the apex, and which supports an oblique, indehiscent, 1-celled, 1—2-seeded samaroid fruit; seeds involved in balsamic juice; cotyledons fleshy; embryo curved.—Trees with abruptly (*Dec.*) impari-pinnated (*Kunth*) leaves; leaflets marked with round and some linear dots.

M. PERUIFERUM, *Dec.* (*Myroxylon peruiferum*, Linn. fil. &c.). A tall and much branched tree, with a smooth warty bark, which is thick and filled with resin, hence has a grateful smell and aromatic taste. Leaflets alternate, of 3 to 5 pairs, with an odd one, subequilateral, oblong, obtuse, emarginate, rounded at the base, sometimes subcordate, coriaceous, smooth; midrib prominent below, and with the flexuose rachis rather hairy; racemes axillary; of the 5 petals the upper or standard broad and roundish, the others linear-lanceolate; stamens spreading; styles deciduous; legumes straw-coloured, pendulous, stalked, linear, oblong, coriaceous, about 2 inches long, the wing very thick on one side, on the other not veined, 1-celled, 1-seeded; seed reniform, involved in liquid yellow balsamic juice, which hardens into resin.—(Lam. Illustr. t. 341. f. 1 a.—g.)

This species has long been supposed to yield the balsam of Peru of commerce, but is probably not the true Quino-quino, or Balsam of Peru tree, about which there have been a number of discrepant accounts. A distinct plant was described by Ruiz as *M. Peruiferum;* it has been named *M. pubescens* by Kunth. *M. pedicellatum* was found in Peru by J. de Jussieu, and stated by him to yield the balsam.

But the latest and most authentic intelligence on the subject was communicated by Dr. Pereira to the Pharmaceutical Journal (Vol. x. nos. v. and vi.). In November, 1850, Dr. Pereira received from Mr. Skinner, late a merchant in Guatemala, specimens consisting of the leaves and fruit of a plant growing on the Sonsonate coast of San Salvador, and yielding balsam of Peru. This plant he at first supposed to be *M. pubescens*, Kunth, but he afterwards found that it differed both from this and from all known species. The specimens were thus described :—

MYROSPERMUM PEREIRÆ. Branches terete and warty; otherwise smooth, ash-coloured. Leaves alternate, stalked, impari-pinnate. Common petioles apparently smooth, but covered with short microscopic hairs. Leaflets 5—11, alternate, with short petioles; about 3 inches long, and 1¼ inches wide; generally oblong or oval-oblong, rounded or slightly tapering at the base, contracting abruptly to an emarginate point; seen in a strong light, and with a magnifier, to be elegantly marked with roundish or linear pellucid spots, the lines being in the direction of the primary veins. Partial petioles and midribs covered also with microscopic hairs. *Flowers unknown.* Fruit a one-celled, one-seeded, winged, indehiscent pod; fruit stalk naked at base, but amply winged above; fruit, including stalk, usually about 3½ inches long; at the peduncular extremity rounded, unequal-sided; at the summit enlarged, tumid, and rounded, with a small point at the side, being the remains of the style. The mesocarp is fibrous; but, immediately outside the endocarp, there are receptacles containing a yellow oleo-resinous juice, which hardens in time. Seed inside loose and dry; cotyledons yellowish, oily, having an agreeable odour.—Sonsonate coast.

Along with these specimens, Dr. Pereira obtained some reliable

information as to the country and mode of production of Balsam of Peru. It has been supposed to be produced on many parts of the western coast of South America; but it appears that it is now only produced by the *Balsam Coast*, in the neighbourhood of Sonsonate, State of St. Salvador, Guatemala, and not by Peru at all. This coast is limited in extent, reaching from the port of Acajutla to that of Libertad. From the tree in question Balsam of Peru is obtained by the Indians, who bring it to market at Sonsonate. It is called by them *Balsamo Negro*, Black Balsam. It is obtained by cutting the trees at the proper season, at the same time slightly burning the bark; what exudes is allowed to soak into rags inserted in the apertures; these are afterwards boiled in water, and the balsam skimmed off the surface. It has to be strained before it is fit for exportation. The whole average annual yield is stated to be about 25,000 lbs. A semi-solid substance, called *Balsamo Blanco*, or White Balsam, is obtained by expression of the seeds and inner portion of the fruit of the same tree. It has been confounded with Tolu Balsam, but is quite distinct from it, and without its peculiar odour. Besides these two products, a fragrant liquid, called *Balsamito*, in high repute throughout Central America as a stimulant and vulnerary, is prepared by digesting in rum the inner part of the fruit of this Myrospermum.

Balsam of Peru is of a viscid syrupy consistence. Sp. Gr. 1·15, of a reddish-brown almost black colour, of a strong balsamic odour, and a bitterish rather acrid taste. It burns with a good deal of smoke. Boiled in water, an acid, and a little volatile oil, are separated from it. It is entirely soluble in Alcohol, and in about 5 parts of rectified spirit. It has been analysed by Fremy, Richter, and Stolze. It appears to consist of 3 chemical compounds. *Cinnameine* is a peculiar acrid oil, heavier than water, constituting about 70 per cent. By the action of caustic potash it is decomposed into Cinnamic acid, which combines with the potash, and a light oily fluid called Peruvine. *Cinnamic acid* constitutes about 6·4 per cent. of the balsam. It is colourless, crystalline, and soluble, and may be formed by exposing oil of Cinnamon to the air, or from Cinnameine, as just stated. Formula, $C_{18}H_7O_3$, HO. *Resin of Peru* forms about 24 per cent. of fresh balsam. It is formed simply by the union of Cinnameine with the elements of water, being thus a hydrate of Cinnameine. It increases in quantity gradually, at the expense of the oil, when the balsam is hardened by keeping.

MYROSPERMUM TOLUIFERUM. *Ach. Rich.* A tree very like *M. Peruiferum.* Branches warty, smooth; leaflets equilateral, from 7 to 8, thin, membranous. ovate, oblong, acuminated, rounded at the base, shining, and as well as the rachis, smooth. The leaves only are figured by Nees von Esenbeck in T. 322; but they are so similar to those of the plant he has figured as *M. peruiferum*, that they might belong to the same plant.—Mountains of Turlaco near Carthagena; banks of the Magdalena and the high savannahs of Tolu.

Balsam of Tolu is probably obtained by incisions made in the bark

of the above tree. It is imported from Carthagena, &c. in vessels of different kinds, sometimes in small ovoid gourds. Ruiz states that it is only the Balsam of Peru in a dried state. And Dr. Weddell found a substance which he supposed to be the balsam of Tolu lying at the foot of *M. Peruiferum* in Bolivia. According to Fremy, it is composed of the same constituents as the other, and will act in a similar manner with reagents. It is usually in a solid state, dry and friable, of a yellowish-red or reddish-brown colour; but when fresh, it is soft and of the consistence of thick honey, from containing more oil, of a fragrant balsamic odour, and warm sweetish taste.

Action. Uses. Stimulant, Expectorant. The Balsam of Peru is a useful application to indolent and also to phagedenic ulcers. Stimulant Expectorant in Chronic Catarrhs, in doses of ♏xv.—♏xxx. made into emulsion with Mucilage or Yolk of Egg. The Balsam of Tolu is more frequently prescribed.

TINCTURA TOLUTANA, L. E. D. Tincture of Tolu.

Prep. L. Digest *Balsam of Tolu* ℥ij. in *Rectified Spirit* Oij. until the balsam is dissolved, and filter. E. D. Nearly twice as strong.

D. f℈ß. to f℈j. made into an emulsion.

SYRUPUS TOLUTANUS, L. E. D. Syrup of Tolu.

Prep. L. Boil *Balsam of Tolu* ℥x. in *boiling Aq.* Oj. for half an hour in a covered vessel, stirring; strain; then dissolve in it *Sugar* ℔ijß. E. D. Tincture of Tolu f℥j is added to about ℔ij. of simple syrup.

Action. Uses. Stimulant, in doses of f℈j.—f℈ij. Sometimes added to flavour draughts.

Ph. Prep. Tinc. Benzoini Comp. L. Trochisci Opii, and Troch. Morphiæ et Ipecacuanhæ, E.

PTEROCARPUS, *Linn.* *Diadelphia Decandria*, Linn.

Calyx 5-toothed, obscurely bilabiate; petals 5, papilionaceous, petals of the keel free; stamens 10, filaments variously united; ovary stipitate, with few (2 to 4) ovules; legume suborbicular, compressed, indehiscent, surrounded by a membranous wing, usually rugose in the middle; 1—3 celled, each cell 1—3 seeded; seeds kidney-shaped.—Trees or shrubs. Leaves unequally pinnated; racemes axillary or terminal, and paniculate. Natives of the tropical parts of India, of the west coast of Africa, and of tropical America; they secrete and exude reddish-coloured juice, which is usually astringent, and hardens in the air.

PTEROCARPUS, L. E. Pterocarpus santalinus, *Linn. fil.* Lignum, L. Wood, E. Red Sandal Wood.

Sandal-wood is mentioned by Serapion and other Arabs, and distinguished into white, yellow, and red. The last is known in commerce as Red Saunders Wood. This is called *rukta chundun* (red Sandal) in India, and the name is applied to the wood of *Pterocarpus santalinus*, and also to that of *Adenanthera Pavonina*. Lignum Pavona was an old dye-wood. That of *Pterocarpus dalbergioides* is said to yield the Andaman Red Wood.

P. SANTALINUS, *Linn. fil.* (*Santalum rubrum*, Kœnig). A lofty tree. Leaflets 3, rarely 4 or 5, alternate, roundish, retuse, smooth above; racemes axillary, simple, or branched; petals long-clawed, crenate, undulate; standard yellow, streaked with red; filaments 10, diadelphous (triadelphous, 5, 4, and 1, *W. and A.*); legume suborbicular, stalked, 1-seeded; the wing somewhat membranous, waved.—A native of the Pulicat (Paulghat) mountains; also of Ceylon.

This tree was pointed out by Kœnig as yielding Red Sandal-wood. Its wood is dark-red with darker-coloured veins, heavy and compact, capable of taking a fine polish; when moistened with water, it is said to produce a fine red colour; and a reddish-coloured juice exudes from its bark, which Kœnig considered a kind of dragon's-blood. The imported wood is similar in appearance, is without odour, has a feeble taste, and sinks in water. Alcohol and Ether readily extract its colour, as do alkaline solutions. Pelletier found it contained Woody Fibre, Extractive, Gallic acid, and about 17 per cent. of a peculiar colouring matter, which he called *Santaline*, and which is somewhat allied to the Resins in properties.

Action. Uses. Used only as a dye, and to give colour to the Tinct. Lavandulæ Comp.

KINO, L. E. D. *K. Indicum*, produced by Pterocarpus Marsupium, L. Succus ex inciso cortice fusus, sole induratus. The concrete exudation of P. erinaceus (in Africa), and other undetermined genera and species, D.

Kino is well known as an astringent substance, in small and shining, brittle, angular fragments of a deep-brown colour, which would seem to be a natural exudation of some one plant, from the uniformity of its appearance. Several kinds of Kino are, however, met with in commerce, as well as described in books, as that of *Butea frondosa* from India, at one time acknowledged by the D. C., and which has no doubt been sometimes imported as Kino. Botany Bay Kino, produced by *Eucalyptus resinifera*, or Brown Gum Tree, at one time acknowledged by the E. C.,—a Jamaica,—and a Columbian Kino,—are mentioned ; and an extract of Rhatany is sometimes enumerated with them. The genuine Kino has been supposed to come from the west coast of Africa. There is no doubt, however, and the fact may be easily ascertained by any one making inquiries in the proper channels, that the best is now imported into this country from Bombay.

Kino seems to have been first introduced into European practice by Dr. Fothergill, in 1757, who states, in a paper in Med. Obs. and Enq. i. 358, that he was indebted for information respecting it to Dr. Oldfield, and that the substance was obtained from the river Gambia, whence he called it *Gummi rubrum astringens Gambiense.* Previous to this, Moon, in his travels in Africa, mentions a red gum as issuing from incisions in trees, and which he mistook for Dragon's-blood. Mungo Park discovered that the tree which yielded this substance was called Pao de Sangue (Blood-tree) by the Portuguese. His

specimens were determined by Mr. R. Brown to belong to *Pterocarpus erinaceus*,— a tree which has since been well figured and fully described in the Flore de Senegambie.

P. ERINACEUS (*Poiret*, Illustr. t. 602, f. 4.) L. E. A tree 40 or 50 feet in height, with the bark exuding a peculiar blackish-coloured juice; leaflets 11-15, alternate, oblong, ovate, obtuse, or emarginate, above smooth, on the under surface covered with dense but short tomentum; flowers yellow; stamens 8—10, monadelphous or irregularly diadelphous; legumes orbicular, membranous, undulate at the margin, and terminated on one side by a sharp point (the base of the style), in the centre covered with stiff bristles, 2-celled or 1-celled; each cell 1-seeded.—A native of Senegambia. Its wood is reddish-coloured. When the bark of its trunk or branches is injured, a reddish-coloured juice exudes, which quickly hardens in the air, becoming of a blackish colour. This brilliant, friable, and astringent substance, though like Kino, does not seem to be collected. "Nous ne l'avons pas vu extraire pour les usages pharmaceutiques sur les bords de la Gambie," (Fl. de Senegambie, i. p. 230, tab. 54,) and no Kino is known to be imported here from the coast of Africa. The D. C. name this species.

The origin of the name Kino has not yet been satisfactorily ascertained. It was introduced into the E. P. 1774 as *Gummi Kino*, and into the L. P. 1787 as *Resina Kino*. I have long been of opinion that the name was derived from the Indian *kuenee*, or *kīni*, applied to a similar exudation from the bark of *Butea frondosa*, of which the Sanscrit name is *Kin-suka* (*Himal. Bot.* p. 195, and *Proc. Royal Asiatic Soc.* p. 50, May, 1838), because this *Butea gum* had been sent as Kino to the above Society from Bombay. An old specimen in the India House is marked *Gum Cheena*. Dr. Pereira, several years since, found "in the warehouse of an old drug firm in London a substance marked *Gummi rubrum astringens*," which he was told had formerly fetched a very high price. This the Author found to be Butea gum. This is, however, very distinct from the Kino of commerce, which, for many reasons, the Author was inclined to think was the produce of *Pterocarpus Marsupium.*

Dr. Pereira states that what he calls *East Indian Kino* is always regarded in commerce as *genuine Gum Kino*, and that an experienced East Indian broker assured him it was the produce of the Malabar coast. He also traced it to Bombay, and to Tellicherry, on that coast. In the official reports of the commerce of Bombay, the Kino exported to this country appears to have been previously imported from the Malabar coast. The Author's attention was again especially turned to this subject on finding in the India House specimens of Kino marked from Anjarakandy, which he recognized as being identical with the present Kino of commerce; but he was unable for some time to ascertain the locality of Anjarakandy, until informed by Mr. Dyer that it was the name of a farm within a few miles of Tellicherry,—that is, near the very place to which Dr. Pereira had traced the East Indian Kino.*

* Since then I have discovered that this was formerly one of the East India Company's plantations, under the superintendence of Mr. Brown, and was visited by Dr. Buchanan, in January, 1801 (*Mysore* II. p. 544), when, he states, numerous valuable experiments were carrying on in the plantation.

Having thus determined the place, the next point was to ascertain the plant which yielded this kind of Kino, as well as its mode of preparation. This was effected by writing to Dr. Wight, stationed at Coimbatore; and though he did not at first succeed, Dr. Kennedy afterwards sent him specimens of the flower, leaves, and fruit, also a small portion of the wood and of the gum. On inspecting these, Dr. Wight states, "the specimens received along with the letter leave no doubt that the Malabar Kino is the production of *Pterocarpus Marsupium.*"

Dr. Kennedy writes that he is informed by his friend Mr. J. Brown of Anjarakandy, that "the juice is extracted when the tree is in blossom, by making longitudinal incisions in the bark round the trunk of the tree, so as to let the gum ooze down into a receiver formed of a broad leaf so placed and fixed in the bark as to prevent the gum from falling on the ground. From the leaf it is made to run into a receptacle placed under the leaf to receive the gum. When this receptacle is filled, it is removed, the gum is dried in the sun until it crumbles, and then filled into wooden boxes for exportation."

Dr. Gibson had already stated (see the above *Proc.* p. 59) that "Kino was the produce of *Pterocarpus Marsupium* (*beula* or *bia*), a tree very common below the Ghats," also that the Kino was exported in considerable quantities from the Malabar coast. Dr. Roxburgh, however, was the first to direct attention to this tree, which he states exudes a red juice, which hardens into a strong, simply astringent, brittle gum-resin, of a dark red colour, strongly resembling that of the *Butea frondosa;* so that the same analysis might serve for both. He further observes, that the specimen of the gum Kino tree (*P. erinaceus*) in the Banksian herbarium is exceedingly like this plant. The specimens of the Indian and of the African Kino were, as we have seen, the produce of two distinct species of *Pterocarpus.**

P. Marsupium, Roxb. (Fig. 62.) A lofty tree, with the outer coat of the bark brown, inner red, fibrous and astringent; leaves sub-bifarious, alternate, leaflets 5—7 alternate, elliptic, emarginate, above shining and of a deep green colour, from 3 to 5 inches long; panicles terminal; petals white with a tinge of yellow, long-clawed, all waved or crested on the margins; stamens ten, united into one body near the base, but soon splitting into two bodies of five each, ovary generally two-celled, legume long-stalked, the under three-fourths orbicular, the upper side straight; the whole surrounded with a waived veined membranous wing rugose and woody in the centre, generally one, sometimes two-celled; seed solitary, kidney-shaped. Roxb. Corom. Pl. ii. t. 116; Fl. Ind. iii. p. 234. A native of the Circar mountains and forests of the Malabar coast, apparently also of those on the Rajmahl hills, at the foot of the Himalayas.

Kino is in small, irregular, somewhat angular, glistening fragments, of a dark-brown or reddish-brown colour, brittle, and affording a pow-

* According to the Rev. F. Mason, a considerable quantity of gum Kino has been exported at intervals from Moulmein in Burmah. It is obtained from certain trees in the Tennasserim provinces, supposed by Mr. Mason to be *Pterocarpus Wallichii* and *P. Indicus.* Both of these trees are called *Padouk* by the Burmese. (P. J. viii. 387.) But Dr. Christison concludes it to be the product of the above *P. Marsupium.*

der which is lighter-coloured than the masses. It is without odour, and has a bitterish, highly astringent, and ultimately sweetish taste. It is not softened by heat; cold water dissolves it partially, boiling water more largely, and the saturated decoction becomes turbid on cooling, and deposits a reddish sediment. Alcohol dissolves the greater

Fig. 62.

portion. It consists chiefly of a peculiar modification of Tannin, with Extractive matter, and, in some of the varieties, of a minute proportion of Resin. According to Vauquelin, it contains no Gallic acid, but Tannin and peculiar extractive 75, red Gum 24, insoluble matter 1. Its aqueous sol. is precipitated by Gelatine (with which it produces a green colour, in consequence of the presence of a little *Catechine*), by soluble salts of Iron, Silver, Lead, and Antimony, by the Bichloride of Mercury, and by the Sulphuric, Nitric, and Muriatic acids. The alkalis favour its solubility in water, but essentially change its nature, and destroy its astringent property.

Action. Uses. Powerful astringent. Useful in restraining mucous discharges, &c.

TINCTURA KINO, L. E. Tincture of Kino.

Prep. L. E. Digest powdered *Kino* ℥iijß. in *Rectified Spirit* Oij. for 7 days and filter. E. This tincture cannot be conveniently prepared by percolation.

Uses and D. Astringent adjunct to Chalk Mixture, &c., in doses of f℥j.—f℥ij.

PULVIS KINO COMPOSITUS, L. Compound Powder of Kino.

Prep. Rub up *Kino* ℥xv. *Cinnamon* ℥iv. and *Dried Opium* ℥j. separately to very fine powder; then mix them.

Uses and D. Astringent and anodyne. Useful in chronic diarrhœa and dysentery in doses of gr. x.—℈j. Grs. xx. contain of Opium gr. j.

PULVIS CATECHU COMP. D., contains *Kino* and *Catechu*, āā ℥ij. with *Cinnamon* and *Nutmeg*, āā ℥ß.

BUTEA FRONDOSA. This plant, as mentioned above, yields by incisions made in its bark an astringent gum, which was at one time supposed to be the genuine Kino of commerce. It is no doubt possessed of similar properties, is frequently used as such in India, and useful like it in Diarrhœas and advanced stages of Dysentery. It is also used in the art of tanning. It has been occasionally sent to this country as Kino, and Dr. Pereira found it in an old drug firm marked *Gummi rubrum astringens.* Its Sanskrit name is *Kin-suka.* It is commonly known in India as *Kīni ke gond*, and also by the name *Kumrkus.* Its chemical characteristics are very like those of the Kino of Pterocarpus. It is very carelessly collected, and therefore often contains impurities. It is remarkable for containing a beautiful red colouring matter, difficult of separation. Analysed by Mr. E. Solly, a portion in the crude state yielded about 50 per cent. of Tannin; but when purified by simple solution in water, so as to separate the impurities, 100 parts contained 73·26 parts of Tannin, 5·05 of difficultly-soluble Extractive, and 21·67 of Gum, with Gallic acid and other soluble substances. The colour and the proportion of Tannin vary with the exposure and season of collection. (*v.* Roxburgh, Fl. Ind. iii. p. 245, and Proc. R. Asiatic Soc. May, 1838.)

SCOPARIUS, L. Scoparium, E. D. Cytisus Scoparius, *Dec.* Cacumen recens et exsiccatum, L. *Fresh* tops, E. Top branches, D. Tops of the Common Broom. *Diadelph. Decand.* Linn.

The common Broom is supposed by some, and the Spanish Broom by others, to be the σπάρτιον of Dioscorides.

A shrub with angular, unarmed branches. Leaves trifoliate, the upper ones simple, stalked, leaflets oblong. Flowers yellow, axillary, solitary, stalked. Calyx bilabiate, the upper lip often entire, the inferior subtridentate. The standard large, ovate. Keel very obtuse, enclosing the stamens and pistils. Stamens all united together. Legume of a dark brown colour, flat, compressed, hairy at the margins, containing about 15 seeds. Indigenous in sandy and uncultivated places throughout Europe.

Broom-tops, like the rest of the plant, have a bitter nauseous taste, and, when bruised, a peculiar odour. Their properties are supposed to depend on the presence of *Cytisine*, and the seeds are the most

effective part. The ashes contain about 30 per cent. of Carbonate of Potash and other salts.

Action. Uses. Emetic and Cathartic in large doses; but used only as a Diuretic in small doses. May be given in dropsies, in powder or in Extract, in doses of gr. x.—ʒß. or in decoction.

DECOCTUM SCOPARII, D. Decoction of Broom-tops.

Prep. Boil *dried Broom-tops* ℥ß. in *water* Oß. for 10 minutes in a covered vessel, and strain. The product should measure about ℥viij.

DECOCTUM SCOPARII COMPOSITUM, L. Dec. Scoparii, E. Compound Decoction of Broom-tops.

Prep. L. Boil *Broom Tops, bruised Juniper berries, fresh Dandelion root,* āā ℥ß. in *Aq.* Ojß. down to a pint and strain. E. Instead of *Dandelion* ʒiiß. of *Bitartrate of Potash* are added.

Efficient Diuretic in doses of f℥j. to f℥iij.

GLYCYRRHIZA, L. E. D. Glycyrrhiza glabra, *Linn.* Radix recens et exsiccata, L. The Root, E. D. Liquorice Plant. *Diadelph. Decand.* Linn.

Liquorice, the produce probably of more than one species, was known to the ancients by the name *γλυκύῤῥιζα.* It was employed by the Arabs, and well known in the East, a produce of Mooltan, &c.

GLYCYRRHIZA, *Linn.* *Diadelph. Decand.*

Calyx naked, tubular, 5-cleft, bilabiate; with the two upper lips united more than the others. Standard ovate-lanceolate, straight; keel 2-petalous, or 2-parted, straight, acute. Stamens diadelphous. Style filiform. Legume ovate or oblong, compressed, 1-celled, 1—4-seeded.—Perennial, herbaceous plants, of the tribe *Loteœ,* with very sweet roots. Leaves unequally pinnated. Racemes axillary. Flowers blue, violet, or white. Natives of the South of Europe, and some of the northern parts of Asia.

G. GLABRA. *Lin.*— The roots running to a considerable distance. Leaflets about 13, oval, slightly emarginate, viscid underneath, stipules wanting. Racemes axillary, erect, shorter than the leaves. Flowers distant, pale lilac. Legumes compressed, smooth, 3—4-seeded. Native of the South of Europe, Syria, foot of Mount Caucasus, cultivated at Mitcham in Surrey, &c.—St. and Ch. 111, 134. *Liquiritia officinalis,* Nees von E. 327.

G. ECHINATA. *Lin.*—Leaflets oval, lanceolate, mucronate, glabrous; stipules oblong, lanceolate; spikes of flowers capitate, on very short peduncles; legumes oval, mucronate, 2-seeded, echinated by bristles. This is sometimes called Russian Liquorice. It is found in Greece and Southern Russia, extending, it is said, into Tartary and Northern China.—Sim's Bot. Mag. 252; Nees, 328.

Species of Glycyrrhiza no doubt also extend into Affghanistan, whence Liquorice-root, *Jeteemudh,* is imported into India. These species may, or may not, be distinct from the preceding.

Most of the Liquorice used is produced by G. glabra, which is extensively cultivated at Mitcham. When the plant is about 4 years old, the roots are dug up with a fork, and arranged in stacks until wanted for the market. The average annual yield is about 1 ton per acre. (P. J. x. 298.)

Liquorice-roots, or rather underground stems, when fresh, are roundish, plump, and smooth. They may be preserved thus for some time, if kept in dry sand, in which the L. C. directs that the fresh

root be preserved; but when dry, they are wrinkled, of a brown colour externally, yellowish and fibrous internally, with considerable sweetness, still more conspicuous when the root is powdered, but in either case it is also a little acrid. Both the fresh and the dry root are officinal in the L. P. The roots consist of Lignin, Starch, Albumen, Wax, Asparagin, Resinous oil, Colouring matter, Phosphates and Malates of Lime and Magnesia, and a peculiar principle which has been called *Glycion* and *Glycyrrhizin*, or Liquorice Sugar, and upon which depends the sweetness of Liquorice, while its acridity is connected with the Oleo-resin. *Glycion* is very sweet, of a yellow colour, and transparent, but uncrystallizable. It seems to partake partly of the nature of acids, and partly of that of alkalis. It is soluble both in water and in Alcohol. This principle has been found in a few other sweetish-tasted roots.

Action. Uses. Demulcent in Catarrhs, Urinary, and Bowel complaints. Useful in sweetening and flavouring medicines. The Powder and Extract are employed in making pills, and the former in covering them.

EXTRACTUM GLYCYRRHIZÆ, L. E. D. Extract of Liquorice.

Prep. L. Digest *fresh Liquorice-root,* bruised, ℔iiß. in boiling *dist. water* Cij.; then boil down to Cj., and strain the liquid while hot; lastly evaporate to the proper consistence. E. D. *Dry* root and *cold* water are employed. The root is cut into slices, dried, and pulverized, and the extract made as *Ext. Gentianæ,* E. D.

When well prepared, this extract is of a brown colour, very sweet, and not at all acrid. Dr. Christison remarks that boiling is unnecessary, indeed injurious, cold water and the process by percolation yielding often 40 to 58 per cent. of very fine extract.

TROCHISCI GLYCYRRHIZÆ, E. Liquorice Lozenges.

Prep. Dissolve *Extract of Liquorice, Gum Arabic* āā ℥vj. *Pure Sugar* ℔j. in *boiling Aq.* q. s. and then evaporate over a vapour-bath to the proper consistence for lozenges.

COMMERCIAL EXTRACT OF LIQUORICE. This is recognized in the E. P. by the same name, *Glycyrrhizæ Extractum,* as the Pharmaceutical preparation. It is not noticed by the other colleges. It is commonly known by the names of *Liquorice, Extract of Liquorice,* and *Liquorice Juice.* It is prepared in large quantities in the south of Spain, in Italy, and in Sicily, and brought to a proper consistence by evaporating the Decoction in copper vessels. It is then formed into roundish or flattened sticks, of a brownish-black colour, often covered with Bay-leaves. The finest is that marked Solazzi. What is called *Refined* Liquorice, in black, shining, pipe-like cylinders, is a mixture of Liquorice and Gum or Gelatine. Liquorice is so well known as not to require detailed notice.

Off. Prep. Infus. Lini Comp. L. E. Decoctum Hordei Comp. L. E. Dec. Sarsæ Comp. L. E. D. Dec. Mezerii, E. Dec. Guaiaci E. Conf. Sennæ, L. E. Dec. Aloes Comp. L. E. D. Tinctura Aloes, L. E. Tinct. Rhei Comp. L. D. Troch. Opii, E. Troch. Lactuarii, E.

TRAGACANTHA, L. E. D. Astragalus verus, L. Succus e cortice exudatus, aere induratus. Gummy Exudation of Astragalus gummifer, *Lab.* and other species, E. D. Tragacanth.

The *τραγάκανθα* of Dioscorides was no doubt a plant of the same genus as that which now yields Tragacanth. Sibthorp considers *Astragalus aristatus*, L'Hert. to be the plant. Arab authors describe it by the name *kusera* or *kutira*, for which, in India, *kuteera* is substituted. This is produced both in the North-west and in the Peninsula of India by *Cochlospermum Gossypium.* Tournefort adduced *A. creticus* of Lamarck, a native of Mount Ida in Crete, to be the plant yielding Tragacanth. Labillardiere describes his *A. gummifer*, a native of Mount Libanus in Syria, as one of the plants; while Olivier states his *A. verus*, inhabiting Asia Minor, Armenia, and northern Persia, as yielding the largest quantity of Tragacanth. Dr. E. Dickson, Physician to the Consulate at Tripoli, when travelling in Koordistan, collected specimens of the plants which he ascertained to yield Tragacanth. These he gave to Mr. Brant, British Consul at Erzeroum, by whom they were sent to Dr. Lindley, who determined that the white or best variety of Gum Tragacanth is yielded by *Astragalus gummifer*, and the red or inferior kind by his *A. strobiliferus.* Dr. Dickson, when in England, favoured the Author with the following observations: "Besides the two last-named species, I observed also a third variety that gave Gum Tragacanth, which, unfortunately, I lost when my things were robbed at Hassen-kalek. From the Koordish mountains being covered with many species of Astragalus, I should think it not unlikely that other varieties of this genus may hereafter be discovered yielding the Gum."

ASTRAGALUS, *Dec.* *Diadelph. Decand.* Linn.

Calyx 5-toothed. Corolla with an obtuse keel. Stamens diadelphous. Legume 2-celled, or half 2-celled in consequence of the dorsal or lower suture being turned inwards, *Dec.*

Sectio Tragacanthœ.—Petioles permanent, thornlike. Stipules adhering to the petioles.

A. VERUS. *Oliv.* L. Flowers yellow, axillary, in clusters of 2 to 5, sessile. Calyx tomentose, obtusely 5-toothed. Leaflets 8 to 9 pairs, linear hispid. A native of Anatolia, Armenia, and Northern Persia; yields Tragacanth, which is collected from July to September. Used in Persia, exported to Europe, and also to India.—Oliv. Voy. 3, t. 44; Nees von E. 329.

A. GUMMIFER. *Labill.* E. D.—Flowers 3 to 5, axillary, sessile. Calyx 5-cleft, together with the legumes woolly. Leaflets 4 to 6 pairs, oblong, linear, smooth. A native of Mount Lebanon, also of Koordistan, where it yields white Tragacanth, but which Labilladiere represents as vermicular in form.

A. CRETICUS. *Lam.*—Flowers axillary, sessile, aggregate. Calyx 5-partite, with feathery setaceous lobes rather larger than the corolla. Leaflets 5 to 8 pairs, oblong, acute, tomentose. Mount Ida in Crete, where it yields a little Tragacanth.

A. ARISTATUS. *L'Her.*—Peduncles very short, usually 6-flowered; calycine teeth long and setaceous; leaves with 6—9 pairs of oblong, linear, mucronate, pilose leaflets; legumes scarcely half bilocular. A native of the Alps of Europe, also of Greece. Sibthorp stated that this species yielded a gum called *τραγοχάνδα* in Greece, which was exported to Italy. Landerer has lately ascertained that Tragacanth is yielded by this species on the hills near Patrass, and exported to Venice and Trieste, or as Levant Tragacanth to Marseilles and Ancona: (c).

A. DICKSONII. *Royle.* (*A. strobiliferus*, *Lindley*, not of Royle, Him. Bot. p. 199).—Flowers capitate in an ovate, sessile, axillary strobile. Bracts imbricate, pinnated, tomentose. Calyx feathery, 5-cleft. Segments of the corolla equal. Leaflets 3-paired, woolly, oval, awned at the apex, narrow at the base. *Lindley.* As Dr. L. has inadvertently named this species *A. strobiliferus*, there being already one of that name, the Author has named it after the discoverer of the plant, who also found that it yielded a reddish-coloured Tragacanth.

Tragacanth exudes from the above plants either naturally or from wounds, and hardens in various forms. It is imported into this country from Smyrna, the Levant, and also from Greece. It is found in commerce either of a white or a reddish-yellow colour, in broad thin flakes, or in tortuous vermicular pieces; the former is the best, and most common here. It is white or greyish, semitransparent, tough, horn-like, and tasteless, and being a little elastic, is with difficulty reduced to powder, unless heated to 110°. In contact with cold water, it absorbs a certain portion, swells, and becomes adhesive and diffused. It does not dissolve except in boiling water, when some change is supposed to take place, a great portion afterwards separating again. It is insoluble in Alcohol. Tragacanth appears to consist of two distinct gummy principles. Bucholz and Guerin Varry found of common Gum or Arabin from 53 to 57 per cent., and of Bassorin 33 to 43 parts, with water and a little Starch, the presence of the latter producing a blue colour with Iodine. The *Arabin* rather resembles than is identical with that of Gum Arabic, for, as first pointed out by Dr. Duncan, its mucilage is not precipitated by Silicate of Potash. The *Bassorin* is like that found in Gum Bussorah, and other imperfectly soluble gums. It is sometimes called *Tragacanthine*, is solid, colourless, without odour or taste, insoluble in water, but absorbing it and swelling up. Nit′ converts it into Oxalic′ and into Mucic acid. Sul′ changes it to a saccharine substance, which is not susceptible of Alcoholic fermentation. Guibourt, however, considers Tragacanth to consist of a peculiar Mucilaginous principle, with a little Starch and Ligneous fibre.

Action. Uses. Demulcent. Useful from its viscidity.

MUCILAGO TRAGACANTHÆ, E. Mucilage of Tragacanth.

Prep. Macerate *Tragacanth* ʒij. in *boiling Aq.* f℥ix. for 24 hours; triturate to dissolve the gum, and strain. It requires a little skill to prepare it. Soubeiran states that it is more viscid if made with the entire than with the powdered gum.

Action. Uses. Demulcent. Used also in making pills and suspending heavy powders.

Pulvis Tragacanthæ compositus, L. E. Compound Powder of Tragacanth.

Prep. L. E. Rub together *Starch* ℥jß. and *pure Sugar* ℥iij. then add *powdered Tragacanth* and *powdered Gum Arabic* āā ℥jß. and mix all carefully together.

Action. Uses. Demulcent in doses of ℈ß—℈j. Used also as a vehicle for other medicines. Or a Syrup may be made with *Tragacanth* ℈j to *Syrup* Oij., which is much commended.

Mucuna, L. E. D. Mucuna pruriens, *Dec.* Fructûs Pubes, L. Hairs from the Pod, E. Hairy down, D. Cowhage or Cowitch. *Diadelph. Decand.* Linn.

The strigose hairs of the plant called *kiwach* in India, as well as those of *Rottlera tinctoria*, are used as Anthelmintic in India, whence the practice was probably introduced, as well as the corrupted name. Sir W. Hooker has distinguished the East Indian plant, *M. prurita*, from *M. pruriens*, which is indigenous in the West Indies.

Mucuna, *Adans.* (*Stizolobium*, Willd.) *Diadelph. Decand.*, Linn.

Calyx with 2 long caducous bracteoles, campanulate, 2-lipped, upper lip entire, lower trifid. Vexillum shorter than the wings and keel. Keel terminated by a polished acute beak. Stamens diadelphous, alternately longer. Legume hispid, oblong, few-seeded, with partitions of cellular substance between the seeds. Seeds oval, roundish or reniform, with a narrow oblong line, the hilum.—Twining plants of the tribe *Phaseoleæ*. Leaves trifoliolate; leaflets hairy on the under surface. Racemes axillary with large purplish, white, or yellow flowers.

M. pruriens, *Dec.*—Leaflets ovate acute, the middle one rather rhomboidal, the latter ones oblique at the base. Racemes lax, many-flowered, interrupted, 1—1½ foot long. Flowers with a disagreeable alliaceous odour, standard flesh-coloured, wings purple or violet, keel greenish white. Calyx hairy, pink, with lanceolate segments. Legume about 3 inches long and roundish, as thick as the finger, with somewhat keeled valves, densely covered with strong and stiff, sharp-pointed brown hairs.—Native of the West Indies. Bot. Reg. 1838, t. 18; Steph. and Churchill, iii. t. 179.

M. prurita, *Hook.*—Leaflets smaller, more obtuse, the middle one truly rhomboidal, the lateral ones dilated on the upper edge. Raceme ovate, compact, more often 3-flowered. Flowers dark purple. Calyx with short triangular teeth. Legumes oblong, much broader, curved and compressed, without any raised keel on the back of the valves, densely covered with sharp stinging hairs; which, white and soft when young, become brown and stiff when ripe.—Native of the East Indies.—Hooker, Bot. Misc. ii. 348; Suppl. t. 13.

The pods of the Kiwach, when young and tender, form articles of diet in India. When ripe, they are of a brownish colour, and covered with innumerable sharp prickle-like hairs, which penetrate into and irritate the skin.

Action. Uses. Mechanical Anthelmintic. Useful in expelling lum-

brici and ascarides, by sticking into their bodies, when pressed against the intestinal parietes, and thus irritating and dislodging them.

D. The pods being dipped into treacle or honey, have the hairs scraped off until the mass has the consistency of an electuary, of which a table-spoonful may be given to adults, or a tea-spoonful to children, and followed by a purgative of Castor Oil, &c.

The Leguminous order produces many substances which are useful as food, or employed in the arts. Of these latter, one which is used in pharmacy as a test, though not officinal for other purposes, requires mention here.

Indigo, the *ἰνδικόν* of Dioscorides, *indicum* of Pliny, is a well known blue dye which is yielded by several plants. In India it is produced by *Indigofera tinctoria* and *Wrightia tinctoria.* In Nubia it is said to be obtained from *Tephrosia apollinea;* and from *T. toxicaria* on the banks of the Niger. But most of that in commerce is produced by *Indigofera tinctoria,* which is cultivated extensively in Bengal, Tirhoot, and in other parts of India, seeds being supplied from the North-west provinces. The plants are cut down when young, before flowering, and steeped in vats of water. During this maceration their juices undergo a kind of fermentation, by which the blue indigo is produced. Oxygen is absorbed, and Carbonic acid evolved. The plants being kept for 7—15 hours at a heat of 85° Fahr., and held below the surface by timbers placed above them, bubbles of gas rise to the surface of the liquid. At first these consist of 8 per cent. Carb. acid gas, and the rest Atmospheric air containing about ¼ less than the usual proportion of Oxygen. Towards the end of the disengagement, the Carb. acid has been found to rise to 40·5, the Oxygen being 4·5, Nitrogen 55, in 100 parts. But when the external air has been rigorously excluded, as much as 86 per cent. of the Carb. acid has been found. When this fermentation has proceeded far enough, which is ascertained by the appearance of a greenish tint on the surface of the yellow liquor, it is withdrawn into lower vats. Here it is submitted to beating and agitation for about 2 hours, and, fresh surfaces being exposed to the contact of the air, more Carb. acid is disengaged and Oxygen absorbed, and the Indigo coagulates in large grains. When this formation does not take place rapidly enough, some precipitant, as Lime water, is added. The Indigo is lastly collected, cut while soft into cubical cakes, and dried in a drying-room.

Indigo is of an intense blue colour; assumes a coppery tint when scratched or rubbed; is insoluble in water, alcohol, ether, oils, and dilute acids and alkalies. It has yielded on analysis 79·50 of pure Indigo-blue (*Indigotin*), Oxide of Iron 5·75, Alumina 0·75, Lime 0·90, Green Veg. matter 8·80, Red resinous do. 2·0, and loss 2·3, in 100 parts. Deoxidising agents destroy its colour, and form *white indigo,* which, when exposed to the air, absorbs oxygen, and again becomes blue. This white indigo is soluble in water, and is therefore very useful in dyeing, as it turns on exposure to an insoluble blue colour. Pure blue Indigo is soluble in 15 parts of strong sulphuric acid, forming a deep blue solution, which is soluble in water, and also is used in the arts. Commercial Indigo consists, as above, of *Indigotin,* or pure indigo-blue, along with many impurities. *Indigotin* has the formula $C_{16}H_5NO_2$. White Indigo contains one atom more of Hydrogen. Under the influence of oxidizing agents, the insoluble *Indigotin* produces *Isatin,* a yellow crystalline compound, which is soluble in water and alcohol ($C_{16}H_5NO_4$). When boiled with a strong solution of potash, Indigotin undergoes a curious and complex series of changes.

The sulphuric solution of Indigo contains a peculiar compound called *Sulphindylic acid* ($C_{16}H_5NO_2 + 2SO_3$). This is contained in the appendix of the L. P. under the form of Liquor Indigo Sulphatis. The indigo should first be dissolved in the strong Nordhausen acid, and the liquid diluted to the proper strength. Its colour is destroyed by free Chlorine, and it is thus a delicate test for the presence of this gas in an uncombined state. It is used by the L.C. for this purpose as a test for *Hydrochloric acid* and *Liquor Sodæ Chlorinatæ.* The indication should be negative in the former, and positive in the latter case.

ROSACEÆ, *Endlicher*. Roseworts.

The ROSACEÆ, *Dec.*, like the Leguminosæ, are divided into several groups, which by most botanists are treated of as distinct orders. Among these, the Amygdaleæ, true Roseæ, and Pomaceæ, contain officinal species. They may all be distinguished from Leguminosæ by the odd division of the calyx being anterior.

The Rosaceæ are found in the temperate and cold parts of the northern hemisphere; a few only occur in the plains of tropical countries. An astringent principle is found in most parts of many of the species, a highly fragrant volatile Oil is also secreted by the Roses, &c. In others, the carpels being berried, or the receptacles fleshy, a highly grateful fruit is afforded.

TORMENTILLA, L. E. Potentilla Tormentilla. Rhizoma, L. The Root, E. Common Tormentil. *Icosand. Polygyn.* Linn.

Tormentil has long been employed. Some suppose it was known to the Greeks.

Root large, perennial, irregularly shaped. Stems slender, spreading, often procumbent or straggling. Leaves sessile or shortly stalked, ternate, the lower leaves quinate on long petioles; leaflets oblong, acute, deeply serrated, a little hairy; stipules smaller, deeply cut. Flowers yellow. Calyx concave, usually 8-parted, in two rows, the exterior smaller. Petals 4, sometimes 5. Stamens numerous. Style lateral. Fruit consisting of numerous small nuts collected upon the flattish dry receptacle; in this species these nuts are longitudinally wrinkled. Seeds suspended.—Common on heaths and meadows throughout Europe.—E. B. t. 863; St. and Ch. i. t. 26.

The rhizome, or rootstock, is tuberous and knotty, with numerous radicles, of a dark-brown colour on the outside, and reddish internally, with little smell, but having a strong astringent taste. It contains about 17 per cent. of Tannin, with Colouring matter, Gum, and a little Volatile Oil. It is employed in tanning in the north.

Action. Uses. Astringent. Useful in Diarrhœa or Chronic Dysentery, in doses of ʒß—ʒj.

The root of the Geum urbanum, or *Common Avens*, an indigenous Rosaceous plant, resembles Tormentil in its properties, and has been used for the same purposes.

DECOCTUM TORMENTILLÆ, L. Decoction of Tormentil.

Prep. Boil *Tormentil* bruised ℥ij. in *Aq. dest.* Ojß. down to one pint and strain.

Action. Uses. Astringent in doses of f℥iß. two or three times a day; or used as an astringent lotion.

ROSA, *Tourn.* Rose. *Icosandria Polygynia*, Linn.

Calyx urceolate, contracted at the mouth, ultimately succulent; limb 5-cut. Segments imbricated, often pinnately divided. Petals 5, obcordate, deciduous. Stamens numerous, inserted with the petals into the rim of the calycine tube. Carpels numerous, inserted into and enclosed within the fleshy tube of the calyx, each thickly covered with hairs and having a lateral style on the inner side; styles all passing through the contracted mouth of the calyx. Fruit globular or ovate, formed of the above fleshy and coloured tube of the calyx

enlarged, enclosing within it numerous hard and bristly little nuts with inverted seeds.—Shrubs, often scandent, leaves usually impari-pinnate, leaflets serrated; stipules attached to the sides of the petiole.

Some species of Rose, being indigenous in Greece, were no doubt known to the Greeks, and *R. canina* is supposed to be their κυνόρροδον. But the Hundred-leaved and the Damask Rose, natives of the East, and cultivated there, were also known and highly esteemed. The term ῥόδον seems to have been also applied to the Oleander, or Rose-Bay, called at one time Rhododendron. Three species of Rose are officinal.

Rosa canina, *Linn.* L. E. Fructus recens, L. Hip of Rosa canina and of several allied species, deprived of the carpels, E. Fruit of the Dog Rose.

Common in hedge-rows, &c., in Europe; is supposed to have been the κυνόρροδον of the Greeks.

This is a variable species, and several of its varieties have obtained distinct names. Shoots assurgent with uniform hooked prickles, and chiefly without setæ. The leaves are without glands, naked, or slightly hairy, the serratures simple or compound. Flowers of a rose-red colour. Sepals pinnate, deciduous. Styles remaining distinct.—E. B. 992; St. and Ch. 11, 100.

The fruit, or rather the inferior part of the calyx, becomes succulent, is of an ovoid form, of a scarlet or crimson colour, and contains within its hollow the true fruit or woolly carpels, which require to be carefully removed, as their setæ are very irritant. The pulpy part has a sweetish acidulous taste. When dried, it yielded to Bilz 25 per cent. of Gum, 30·6 of uncrystallizable Sugar, of Citric′ 2·95, of Malic′ 7·77, with several Salts, a little Tannin, and Volatile Oil.

Confectio Rosæ Caninæ, L. Conserva Rosæ fructus, E.

Prep. L. Pound up *Fruit of the Dog-rose*, without the seeds, ℔j. with *powdered Sugar* ℔j. and ℥viij. gradually added, until the whole is incorporated. E. Beat up the pulp of *Hips* with three times their weight of *White Sugar* gradually added.

Action. Uses. Acidulous, Refrigerant. Chiefly valuable as a vehicle for other medicines.

Rosa gallica, *Linn.* L. E. D. Petalum nondum explicatum, recens et exsiccatum, L. Petals of the Red (or French) Rose, E. D.

The Red, or French, called also the German and Austrian Rose, is a native of the middle and south of Europe, and may have been known to the ancients. Dr. Christison states that the true Red Rose of pharmacy is a variety, considered by some a distinct species, and called *Rosa provincialis*, having been probably introduced into Europe by the Crusaders, from its native country, Barbary. It is cultivated at Mitcham.

A dwarfish, stiff, short-branched bush, with the shoots armed with nearly equal uniform prickles and glandular bristles intermixed. Leaflets stiff, ellipti-

cal, rugose. Flowers several together, large, erect; with leafy bracts. Sepals ovate, leafy, compound. Fruit oblong.—Nees von E. 303; St. and Ch. iii. 99.

The petals alone are officinal; they look velvety, are of a purplish-red colour, with whitish down; have little scent when fresh, but this becomes developed as they dry. The half-blown buds are ordered by the L. C.; from these the calyxes and claws being cut off, they are quickly dried and sifted to get rid of impurities. They should be kept in well-closed vessels, and in the dark. In this state, they have a rose-like odour, will long retain their colour, and have a slightly bitter, astringent taste. Analysed, they have been found to contain a little Tannin, Gallic acid, Colouring matter, a little Volatile Oil, with other vegetable matters and some Salts, and a trace of Oxide of Iron. The Infusion strikes a black colour with ferruginous salts.

INFUSUM ROSÆ COMPOSITUM, L. Inf. Rosæ, E. Inf. Rosæ acidum, D. Infusion of Roses.

Prep. L. Separate the *petals* of dried *Red Rose* ʒiij. pour upon them *Boiling distilled water* Oj. then add *Dil. Sulph. acid* fʒiß. Digest for 2 hours, strain, and lastly add *Sugar* ʒvj. E. Same proportions; a glass or porcelain vessel, not glazed with lead, is ordered to be used. D. Rather stronger.

Action. Uses. Slightly Astringent and Tonic. The colour imparted to water is heightened by the acid. A much approved vehicle for saline purgatives, Quinine, &c. The presence of Sulphuric′ must never be forgotten in prescribing it.

D. f℥iß. every three hours. Makes a good gargle with acids, or Alum and Honey.

CONFECTIO ROSÆ, L. D. Conserva Rosæ, E. Conserve of Red Roses.

Prep. L. Beat in a stone mortar *Fresh Red-rose petals* ℔j. Add gradually *Sugar* ℔iij. and thoroughly incorporate. E. D. Similar.

Action. Uses. Slightly astringent in doses of ʒj. or ʒij. but chiefly useful in making pills.

MEL ROSÆ, L. E. Honey of Roses.

Prep. L. Macerate *dried Red-rose petals* ℥iv., first separated, in *boiling dist. water* f℥xvj. for 2 hours, then press them lightly with the hand, and strain. Macerate what remains again for a short time in *boiling dist. water* f℥viij. and pour off the liquor. Add to this half of the first infusion, and set aside the rest. Add then the mixed liquids to *Honey* ℔v., and evaporate in a water-bath until, when the rest of the liquid is added, it may become of a proper consistence. E. Similar.

Action. Uses. Mild Astringent, and being pleasant-tasted, is applied to Aphthæ, and used as a vehicle in gargles.

SYRUPUS ROSÆ GALLICÆ, E. D. Syrup of the Red Rose.

Prep. E. Proceed as for Syrup of Damask Rose, employing *Dried Red Rose Petals* ℥ij. boiling *Aq.* Oj. pure *Sugar* ℥xx. D. ℥ij. of *petals* are boiled in *Aq.* Oj. until all their colour is extracted, and *Sugar* q. s. added.

Action. Uses. Slightly astringent; but chiefly used for colouring and flavouring medicines.

ROSA CENTIFOLIA, *Linn.* L. E. D. Petalum recens, L. Petals, E. D. The Hundred-leaved or Cabbage Rose.

This Rose has long been cultivated in Europe, having been introduced from the East. It is said to be indigenous in the Eastern Caucasus. The Persians also have a *sud-burg* (or hundred-leaved Rose), and the ancients were acquainted with one having many petals. Of the above species there are many varieties.

A bush with erect shoots, which are rather thickly covered with nearly straight prickles, scarcely dilated at the base, intermixed with glandular bristles, all of different forms and sizes, the large ones falcate. Leaflets 5 to 7, oblong or ovate, glandular at the margin. Flowers several together, drooping. Buds short, ovate, with leafy bracts. Sepals in flowering, spreading not deflexed, leafy, more or less pinnate and with the peduncles glandulously viscid. Fruit ovate.—Cultivated at Mitcham, &c.—Nees von E. 302; St. and Ch. iii. 99.

The petals of this species are well known for their fragrance, on which account, as well as for the beauty of the flowers, they are extensively cultivated, and consequently numerous varieties have been produced; so that it is difficult to say which is a species and which only a variety. In many parts of India, *Rosa damascena*, or Damask Rose, is cultivated for the purpose of yielding the *Attar* of Roses, as well as Rose-water. As the species of Rose are but few in India, perhaps the same may be cultivated in the extensive Rose Gardens of Ghazipore, which is the great mart for Attar in India. The petals should be collected just when fully blown, and if quickly dried, will long retain much of their fragrance, especially if preserved with salt. Besides the Volatile Oil, these petals contain a slightly laxative principle, with some of the same constituents as the other Roses.

SYRUPUS ROSÆ, L. Syr. Rosæ centifoliæ, E. Syrup of Roses.

Prep. L. Macerate *fresh Petals of Rosa centifolia* ℥vij. in *boiling Aq.* Oiij. for 12 hours. Strain. Evaporate the strained liquor in the water-bath till only Oij. remain. Then add *Sugar* ℔vj. and lastly mix in *Rect. Spirit* f℥vß.
The E. College direct the Syrup to be prepared without concentration, and the Sugar to be dissolved in the liquor with the aid of heat. No spirit.

Action. Uses. Slightly laxative. Given to infants in doses of fʒj.—fʒiv.

AQUA ROSÆ, L. E. D. Rose Water.

Prep. L. Mix *fresh petals of Rosa centifolia* ℔x. with *Aq.* Cij. Distil Cj. E. Similar; *Rect. Spirit* f℥iij. are added before distillation; fresh petals are to be used, or dried petals which have been preserved by pounding them with twice their weight of common salt. D. *Essential Oil of Roses* ♏xx. are shaken with *Aq. dest.* Cß. and filtered.

Action. Uses. An agreeable vehicle for lotions and for active medicines.

Oleum Rosæ, E. D. Volatile Oil or Attar of Roses.

This is imported from India and the Levant. It is too well-known for its delightful fragrance, to require a detailed description. 100,000 roses distilled with water yield only about 180 grains of Attar. It varies in colour, and becomes solid below 80° F. Sp. Gr. 0·832 at 90° F. Soluble in Alcohol, and a little taken up by water, as in Aqua Rosæ. It consists of two principles, one being a *solid* the other a *liquid volatile oil.* The former is scarcely soluble in Alcohol. In distilling Rose-water in this country, some of the crystalline Volatile Oil is sometimes obtained. As it is added by the perfumers to many scents, so it may be employed in imparting an agreeable odour to ointments and lotions.

Kousso.—This drug, which has been lately employed with considerable success as an Anthelmintic, consists of the flowers of the Brayera anthelmintica, *Kunth*, a Rosaceous plant which grows in Northern Abyssinia, and belongs to the tribe Dryadeæ of Decandolle. The flowers are apetalous and diœcious; they have been imported in the dried state into France by M. Rocher d'Héricourt, and are used both in that country and in England for the purpose of expelling Tapeworm, for which they were first employed by the native Abyssinians. Mr. Savory has also obtained a supply of the drug from Aden. Some Kousso forwarded to Dr. Budd from this port, and contained in a goat-skin bag, was examined by Mr. F. Headland, and found to consist of the flowers and flowerstalks of the same plant as that imported by M. d'Héricourt from Africa. The mode of administration of the Kousso is peculiar. About ½ an ounce is infused in a glass of warm water, and taken thus, flowers and water together, on an empty stomach. The dose may be followed up by a mild purge, as a dose of Castor oil. The flowers contain a considerable quantity of Tannin, and an odorous principle, to which last the anthelmintic property is probably owing. (See account of Kousso by Dr. Pereira in Pharm. Journal, x. 15).

Pomaceæ, *Juss.* Apple-worts.

This order is considered by some as a tribe of Rosaceæ. They mostly inhabit the North Temperate Zone and the great mountainous range of India. They are chiefly remarkable for their edible fruit when cultivated, abounding in saccharine matter with a pleasant acidity. In a wild state, they are austere or astringent and acid. By distillation of the seeds of some of the Pomaceæ a very little Hydrocyanic acid is obtained.

Cydonium, L. Cydonia vulgaris, *Pers.* Semen. L. Seeds of common Quince. (*Pyrus Cydonia*, Linn.) *Icosandria Pentagynia*, Linn.

The Quince (*κυδονία*) was known to the ancients and Arabs; the seeds (*bihee dana*) are employed medicinally in India, being imported from Caubul and Cashmere, where the tree is cultivated.

A moderately sized, much branched, but crooked tree. Leaves ovate, obtuse at the base, quite entire, with their lower surface, as well as the calyxes and pedicels tomentose. Flowers few, of a white or rose-colour, in a kind of umbel. The pomes closed, globose or oblong, 5-celled; *cells many seeded*, cartilaginous. Seeds enveloped in condensed mucilage.—Nees von E. 305; St. and Ch. ii. 114.

The fruit of the Quince is of a yellow colour, downy, and remarkable for its fine odour. The ancients used it as a medicine, but it is now chiefly employed for flavouring other fruits, or as a preserve.

It contains some Astringent matter, with Malic acid, Sugar, and Azotised matter. (*Soubeiran.*) The seeds are oblong, pointed, convex on the outside, and with one or two flat sides, according to the pressure of neighbouring seeds. Their testa, or thick seed-coat, is covered with condensed mucilage, which, according to Bischoff, as quoted by Dr. Pereira, is lodged in very fine cells, and becomes easily dissolved out when submitted to the action of boiling water.

Decoctum Cydoniæ, L. Decoction of Quince Seeds.

Prep. Boil with a gentle heat for 10 minutes *Quince Seeds* ℨij. in *Aq. dest.* Oj. Strain.

Action. Uses. Demulcent. Chiefly applied externally. It is analogous to the Mucilage of Linseed, or Linseed Tea, being viscid and insipid. It has been proposed to evaporate it to dryness, and powder the residue, which will readily afford mucilage with water.

Dr. Pereira considers *Quince Mucilage* as a peculiar substance, and calls it *Cydonin.*

Amygdaleæ, *Juss.* Almond-worts. *Icosandria Monogynia*, Linn.

This order, like the last, is often included amongst the Rosaceæ. The Amygdaleæ are found wild in the mountainous parts of the North temperate Zone, but are now cultivated in most parts of the world with moderate climates. The fruit of many is edible; the kernels abound in oil; many exude gum; and some are remarkable for secreting Hydrocyanic acid.

Amygdalus communis, *Linn.* L. E. D. Semen. Nuclei. Kernels. *Var. α.* Amygd. dulcis. Sweet Almond. *Var. β.* Amygd. amara. Bitter Almond.

The Almond is mentioned in the Bible. Both varieties are found in the countries from Syria to Affghanistan. Both were known to the ancients and to the Arabs.

A small tree with lanceolate leaves, which are glandularly serrate, young leaves folded flat; petioles glandular, equal in length to, or larger than the transverse diameter of the leaf. Flowers nearly sessile, solitary, appearing earlier than the leaves. Tube of the calyx campanulate. Fruit a dry drupe, ovoid compressed, externally tomentose, when ripe bursting irregularly. Within this is contained a hard but brittle shell, within which is enclosed a kernel, well known as the Almond.—St. and Church. i. t. 43. Nees, 312, 313.

Though a few botanists have considered the Sweet and Bitter Almonds to be distinct species, the generality describe them as varieties of one species. Nees von Esenbeck indeed states that both are sometimes obtained from the same tree. De Candolle enumerates several varieties, such as may be observed in all cultivated plants.

Var. *α. dulcis.* The Sweet Almond has ash-green leaves, with the glands on the base of the leaf and lower serratures. The style much longer than the stamens. Shell hard; but some sweet almonds have very fragile shells, and are called *kaghuzee*, that is, *papery*, in the East.

Var. *β. amara.* The Bitter Almond has the petioles of the leaves studded with glands, the style equal in length to the stamens, and the shell hard or brittle.

Amygdala Dulcis, E. D. (*A. Jordanica*, L.) Sweet Almonds are sometimes sold with the brittle shells on them, and are then called *Shell Almonds.* Almonds are imported into this country from the south of Spain and of Italy. They are known by the names of Jordan, Valentia, and Italian Almonds. They are introduced into India from Persia and Affghanistan. The Almond is ovoid, being rounded at one end and pointed at the other; flattened; of a cinnamon-colour, from the tough testa with which the kernel is enveloped. When blanched, they are found to be composed almost entirely of two large and conspicuous cotyledons, white in colour, without smell, and of a mild agreeable taste. When old or worm-eaten, they have an unpleasant or rancid taste. Analysed by Boullay, they were found to contain 54 per cent. of a bland Fixed Oil, 24 of *Emulsine*, 6 of liquid Sugar, 3 of Gum, Water 3·5, Lignin 4·0, and Acetic' 0·5; the seed-coats, 5 per cent., contain a little Tannin. The *Emulsine* has also been called *Synaptase*, also the Vegetable Albumen of Almonds. It is white, and owing to its presence the Oil becomes suspended in water in *Almond Emulsion.* When the Oil has been expressed, we have, as in the case of Linseed, a *cake* left, which, being dried and powdered, is known under the name of Almond powder.

Action. Uses. Dietetical, Demulcent, and Emollient.

Confectio Amygdalæ, L. Conserva Amygdalarum, E. Almond Confection or Paste.

Prep. L. Take *Sweet Almonds* ℥viij., and having macerated in cold water and removed the skins, rub them through a fine metallic sieve; then beat well with *powdered Gum Arabic* ℥j. and *Sugar* ℥iv. into a uniform pulpy mass. (Or it may be longer preserved if the dried ingredients are kept in powder and mixed with water when required). E. Similar.

A pleasant-tasted Confection, useful for making the following.

Mistura Amygdalæ, L. E. D. Almond Emulsion or Milk.

Prep. L. Add gradually *Aq. dest.* Oj. to *Confect. Almond* ℥ijß.; triturate constantly, and strain through linen. E. Similar, about ½ as strong; or make as follows: Take *Sweet Almonds* ʒj. and ʒij., steep in hot water and peel them, beat them to a smooth pulp with *pure Sugar* ʒv., and *Mucilage* f℥ß., adding gradually *Aq.* Oij. Strain. D. Similar to second E. formula, but contains 2½ times as much almonds.

Dr. Pereira recommends *Sweet Almonds* ʒiv. *powdered Gum Arabic* ʒj. *White Sugar* ʒij. *Water* f℥vjß. Blanch the Almonds, beat them with the Sugar and Gum, the Water being gradually added. (*v. Mist. Acaciæ*, E.).

Action. Uses. Demulcent and Emollient, or as a vehicle for other medicines.

Oleum Amygdalæ, L. Expressed Oil of the seeds of either the Sweet or Bitter Almond.

A bland oil, apt to become rancid, of a pale yellow colour, very

liquid, Sp. Gr. 0·917—0·920; consisting of Margarine 24, Elaine 76 parts in 100.

Action. Uses. Laxative and Emollient, like Olive and other fixed Oils.

AMYGDALÆ AMARÆ. Bitter Almonds are usually found shelled They are smaller, and commonly imported from Mogadore. Like the Sweet Almond, they are without smell, but have a strong and peculiar bitter taste. Like them also, they contain bland fixed Oil, with *Emulsine*, and readily form a white emulsion with water. They also contain a small portion of an albuminous but very peculiar principle, called *Amygdaline*, soluble in water and in boiling Alcohol, colourless, and crystallizable; this contains Nitrogen, and has a pure bitter taste, but no smell ($C_{40}\,H_{27}\,N\,O_{22}$). It should be remarked that neither volatile Oil nor Hydrocyanic acid is mentioned as a constituent of Bitter Almonds. Indeed, both have been proved by chemists not to exist in them, though they may easily be obtained from them. This is by the mutual action, with the assistance of water, of one principle, Emulsine, when in solution, upon another, the Amygdaline; the one being supposed to bear the same relation to the other that Diastase does to Starch, or acting as Yeast does upon Sugar. The result, made immediately evident by the smell, is the production of the Oil of Bitter Almonds, which is a true Essential Oil, and contains Hydrocyanic acid.

Action. Uses. Sedative, Poisonous. Bitter Almonds, even in small doses, disagree with many, producing derangement of the digestive functions, and a kind of nettle rash. They have proved fatal to men, children, and small animals. They are used for their flavour in confectionary, but seldom employed medicinally.

Oil of Bitter Almonds, though not officinal, requires to be noticed, as it is sometimes employed therapeutically, and is, moreover, a very powerful poison. Ordinarily, Oil of Bitter Almonds is of a yellow amber-colour, and has an odour of Hydrocyanic acid in addition to its own, which is usually considered rather agreeable. It has a bitter and burning taste, from containing Hydrocyanic acid (8·5—14·33 per cent.) with some other substances. The Sp. Gr. of this oil varies considerably. It is often adulterated with alcohol, but Mr. Redwood states that no reliance can be placed on the sp. gr. to detect this adulteration. The essential part of the oil is *Hydruret of Benzule.* This, when pure, has a sp. gr. of 1·043. It is colourless and limpid, has the peculiar almond flavour, but is not poisonous. But the crude or commercial *Oil of Bitter Almonds* contains also *Hydrocyanic acid*, *Benzoic acid*, *Benzoine*, and some other ingredients. The two last-mentioned are produced by the decomposition of the *Hydruret of Benzule* ($Bz\,H{=}C_{14}H_5O_2{+}H$). The HCy may be separated from the oil, which is then soluble only to a small extent in water, but very readily in Alcohol and Ether. Mr. Redwood detects adulteration with spirit by adding to the oil an equal bulk of Nitric acid of

sp. gr. 1·5. If the oil be pure, no immediate change takes place; but when any alcohol is present, there is soon a brisk effervescence, and a disengagement of nitrous vapours. (P. J. xi. 486.)

Action. Uses. Poisonous, like Hydrocyanic acid, which it contains, and sometimes used for the same purposes, in doses of ♏ $\frac{1}{4}$ to ♏ j.; also for flavouring.*

PRUNUM, L. Pruna, E. D. Prunus domestica, *Linn.* Fructus præparatus. *Drupæ exsiccatæ.* The Dried Fruit. Prunes.

The common Plum-tree is supposed to be the κοκυμηλέα of Dioscorides; but this may have been *Prunus Cocumilia* of Tenore, a native of Calabria, a species which is supposed by some to be the original of the former. The astringent juice of *Prunus spinosa*, or the Sloe, inspissated, is substituted for the ancient *akakia.*

A small tree with smooth branches and elliptical leaves. Flower buds formed of one or two flowers. Petals white, oblong-ovate. Drupes fleshy, ovate-oblong. Nut smooth or furrowed, without small holes.—Many varieties of it are cultivated everywhere in Europe. It occurs apparently wild in some places, but it is thought to be originally a native of Asia.

The fruit in a dried state forms the Prunes or French Plums of the shops, which are prepared in France chiefly from the St. Catharine and the Green-gage varieties, and "in Portugal from a sort which derives its name from the village of Guimaraens, where they are principally dried." A variety (the *Quetsche*) is also dried in Germany. The black Plums "*dits à médecine*," are prepared from the small black Damascus Plums, and are more acid and laxative. (Merat and De Lens.) Prunes are composed, like the other fruits of this family, of a large proportion of water, with about 20 per cent. of solid matter, consisting of Sugar, Gum, Malic acid, some Azotized matter, Pectin, and Ligneous fibre.

PRUNUM PRÆPARATUM, L., is prepared in the same way as *Cassia præp.*, and *Tamarindus præp.*, and consists, like them, of the finer part of the pulp of the fruit.

Action. Uses. Demulcent, Dietetical, Laxative. Given entire or in decoction, or in the form of the prepared pulp. This forms an ingredient in the Confect. Sennæ.

LAURO-CERASUS, E. D. Leaves. Prunus Laurocerasus, *Linn.* E. Cerasus Lauro-cerasus, *Loisl.* and *Dec.* D. The Cherry Laurel.

This shrub, so common in every garden in England, is a native of Asia Minor, especially near Trebizond, whence it was introduced into Europe by Clusius about 1576.

* Dr. Pereira remarks, that though its strength is variable, it is in general four times the strength of officinal Hydrocyanic acid, and that f℥ij. of the Oil in *Rectified Spirit* f℥vj. form an useful essence for flavouring and scenting.

A small tree, or smooth evergreen shrub. Leaves with short petioles, oblong, acuminate, remotely serrated, shining on the upper surface, with 2 or 4 glands beneath, and coriaceous in texture. Racemes simple axillary, about the length of the leaves. Petals white, roundish, spreading. Stamens 20. Drupe destitute of bloom, round, black, about the size of a small cherry.—Nees von E. 317, St. and Ch. ii. t. 117.

This plant, being commonly called Laurel, and found in every shrubbery, must not be confounded, as it usually is, with the true Laurel or Sweet Bay (*v. Laurus nobilis*), which does not possess any of its deleterious properties. It should also be distinguished from the Portugal Laurel (*Cerasus lusitanica*). The leaves alone are officinal. In their dried state they are bitter and astringent, without aroma; as also in the fresh state, until they are bruised, when the ratifia odour peculiar to so many of the *Amygdaleæ* is exhaled, from the formation probably of an essential Oil and Hydrocyanic acid, in the same way as in the Bitter Almond, by the reaction of different principles on each other. Dr. Christison has made the important observation, that the buds and unexpanded young leaves in May or June yield 6·33 grs. of Oil in 1000, but that the proportion sinks to 3·1 grs. in July, and goes on gradually diminishing to only 0·6 in the subsequent May, when they are twelve months old, and when the new unexpanded leaves of the same plant give ten times as much. By distillation with water, the Essential Oil is obtained, which exactly resembles that of Bitter Almonds; but the distilled Oil is alone in general employed, and is officinal in the E. and D. P.

Fig. 63.

Action. Uses. Poisonous, Sedative. The powdered leaves have been given in doses of from gr. iv.—gr. viij.. and in cataplasms with Flour or Linseed-meal are sometimes applied to sores.

AQUA LAURO-CERASI, E. D. Water of the Cherry Laurel. Laurel-water.

Prep. E. Take *fresh leaves of Prunus Lauro-cerasus* ℔j. *Aq.* Oijß. Chop down the leaves, mix them with the water, distil off a pint, agitate the distilled liquid well, filter if any milkiness remains after a few seconds of rest, and then add *Comp. Spirit of Lavender* f℥j. D. Similar; but no Spirit of Lavender. These directions are intended to obtain uniformity of preparation. It is, however, always uncertain. It is stronger when fresh made, or from young leaves; but as some opacity is created when there is excess of oil, this may be got rid of by filtering.

Action. Uses. Poisonous, Sedative, used in the same cases as Diluted Hydrocyanic acid, in doses of ♏x.—fℨß.

ACIDUM HYDROCYANICUM DILUTUM, L. D. Acidum Hydrocyanicum, E. Diluted or Medicinal Hydrocyanic Acid: that is, diluted with 50 parts of water, L. or about 26, E. P. F. *Acide hydrocianique.* G. *Blausäure.* Prussic Acid.

Hydrocyanic Acid is so named from being a compound of Hydrogen and Cyanogen, and is called Prussic acid because it was first obtained from Prussian Blue. (p. 156.) Scheele in 1782 first obtained it diluted, and Gay-Lussac in 1815 in a pure state. It was employed in medicine in 1809 by Brera, in 1817 by Majendie, and in 1819 by Dr. A. T. Thompson in this country. But its effects had long previously been obtained by the employment of the above Laurel-water.

Hydrocyanic' is of vegetable origin, being contained, as above mentioned, in the Distilled Oil and Waters both of the Bitter Almond and of the Cherry Laurel. It may also be obtained from many others of the Amygdaleæ, as kernels of Peaches, and of various Plums and Cherries; also from some of their flowers, and from Apple-pips. It is, however, usually obtained by decomposing some of the compounds of Cyanogen.

CYANOGEN ($C_2N=Cy=26$), is so named from κύανος, *blue*, and γεννάω, *I generate*, because it is an essential constituent of Prussian Blue. Though a compound body, it acts the part of a simple body in entering into chemical combination, and is usually adduced as a type of organic radicals (p. 17). It is composed theoretically of equal volumes of Carbon and of Nitrogen, or of 2 Eq. C + 1 Eq. N, and is therefore a Bicarburet of Nitrogen, being, when isolated, a colourless permanent gas, with a penetrating and peculiar odour. Its compounds are called Cyanides or Cyanurets; of these some are found in various animal secretions. Cyanogen, in various conditions, may be produced by heating nitrogenized organic matter in contact with a base. Hence some of the salts which are employed in making Hydrocyanic acid are obtained from animal matter. Cyanogen is interesting to us as combining with Hydrogen to form this acid.

Hydrocyanic Acid ($H\,Cy=27$), called also Cyanide of Hydrogen, was obtained by Gay-Lussac in a pure anhydrous state. This solidifies at the zero of F., but readily becomes liquid with heat, when it is transparent and colourless; has a sp. gr. of nearly 0·697 at 64° F.,

tastes at first cool, then acrid; but it can be tasted only with the greatest caution. It has a strong and very peculiar odour, differing from that of the Oil of Bitter Almonds. If a few drops be placed on paper, a part will volatilize so readily as to freeze the rest. It boils at 79° or 80°, when the acid rises in the state of vapour, which is combustible, and will form explosive mixtures with Oxygen. It rapidly decomposes, becoming of a reddish-brown colour, and finally exhaling an ammoniacal odour. Dr. Christison states, however, that he has kept it unaltered at 32° for three weeks. It has a feeble reaction as an acid, and forms Hydrocyanates (*i. e.* Cyanides, *v.* p. 21), which are liable to decomposition. It is very soluble in Alcohol and in water, the solution in the latter forming the following.

Medicinal or Diluted Hydrocyanic Acid. This differs from the former chiefly in its strength, having the same characteristic taste and odour, though in a less degree. The odour is so peculiar as to be enumerated among its tests. "But care must be taken not to confound it with the odour of Bitter Almond Oil, as many do; for that odour is decidedly different, and depends much more on a true Essential Oil than upon the concentrated Hydrocyanic acid." (*c.*) It differs also in being more easily preserved, which is especially the case when it has been made by the action of S′ on Ferrocyanide of Potassium; or when it has a small quantity of some other acid mixed with it; or is kept in a dark-coloured bottle, or in one covered with paper, and well stopped. The medicinal acid of the shops has been found to vary in the proportion of the strong acid it contains, from 1·4 to 5·8 per cent. The strength of the acid of the L. P. is 2 per cent.; of that of the E. P. 3·84 per cent.; of that of the D. P. about the same as L. Fearful consequences have ensued from the want of uniformity in its preparations; hence the Colleges give directions for ascertaining its strength. (*v.* Tests.)

Strength of the Medicinal Acid. In the D. P. the Sp. Gr. only is indicated as a criterion of its strength, and that of course is always lower as the acid is stronger; but this method is not sufficiently precise for ordinary use. The acid of the D. P. has a Sp. Gr. of ·997. In the L. P., H Cy′ is directed to be prepared of such strength that 100 grs. of it will exactly precipitate 12·59 grs. of Nitrate of Silver dissolved in water. This precipitate is readily soluble in boiling Nitric acid, and 5 parts of it correspond to 1 of real acid. Dr. Christison states that so rigorous a test would exclude nine-tenths of the acid even of respectable shops, and that "irregularity within certain limits may exist without the slightest danger or inconvenience in medical practice." It is stated by the E. C. that 100 minims of their acid (*i. e.* gr. 91, *v.* p. 6) should entirely precipitate 22 grs. of Nit. of Silver. Therefore, if the L. acid contains 2 per cent., this must contain about 3·84 per cent. of real acid, so that it is nearly twice as strong as the other. The E. C., however, allows a trifling variation in strength.

Dr. Ure has suggested ascertaining the quantity of Red Oxide of

Mercury which a given weight (say 100 grs.) of this acid will dissolve; and as the Eq. of the Oxide, 216, is to 2 Eq. 54, of the acid in Bicyanide of Mercury, as 4 to 1, so we have only to divide by 4 the weight of Oxide dissolved, and the quotient will represent the quantity of anhydrous acid present.

Prep. L. Mix *Sulph. acid* f℥vij, with *Aq. dest.* f℥iv., and, when cold, place them in a retort, and add *Ferrocyanide of Potassium* ℥ij. first dissolved in *Aq.* Oß. Pour *Aq.* f℥viij. into a cooled receiver; then, fitting on the retort, let f℥vj. of acid, distilled in a sand-bath at a gentle heat, pass over into the water. Lastly add *Aq.* f℥vj. more, or so much that 100 gr. of this acid may exactly precipitate 12·59 gr. of *Nitrate of Silver* dissolved in dist. water. The product amounts to f℥xx.

E. D. Similar. The E. C. makes use of ℥iij. of Ferrocyanide, f℥ij. of *Sulph. acid,* and f℥xvj. of water. The distillation is continued until the residuum begins to froth up. The product measures f℥xvi.

The D. C. employs ℥j. of *Ferrocyanide,* f℥j. of *Oil of Vitriol,* and f℥xij. of water. Slips of Platinum foil are introduced into the retort to moderate the effervescence, and the distillation conducted through a Liebig's Condenser, as usually ordered by the D. P. The product is diluted until it measures f℥xvj.

A simple process is that originally recommended by Mr. Everitt, and may be adopted for extemporaneously obtaining Dil. H Cy′. *Cyanide of Silver* gr. xlviijß. are to be added to *Aq. dest.* f℥j. with which *Hydrochloric acid* gr. xxxixß. had been previously mixed, and well agitated together in a close phial (The Hydrogen of the acid combining with the Cyanogen of the Cyanide, Hydrocyanic′ in the proportion of 2 per cent. is formed. The Chlorine set free combining with the Silver, forms a white precipitate of Chloride of Silver). After a short interval, the clear liquor is to be poured off, and kept out of the light.

Another way in which the acid is sometimes prepared, and which was ordered in the last D. P., is to distil *Hydrochloric acid* with *Bicyanide of Mercury.* It is now seldom adopted. The Society of Apothecaries used to obtain it by a process similar to this: Sp. Gr. 0·995, indicating 2·9 per cent. of real acid. By a similar process, but without water, Gay-Lussac obtained the anhydrous acid, by passing it through pieces of Chalk and of Chloride of Calcium.

It has already been stated (p. 154) that Ferrocyanide of Potassium consists of a bibasic radical, Ferrocyanogen ($Fe\ Cy_3$) in combination with two equivalents of Potassium. In the above process this salt is decomposed by the action of Sulph. acid ; the results of this decomposition being *Hydrocy. acid,* which distils over; and *Bisulphate of Potash,* with a peculiar compound called *Yellow Salt,* which both remain behind in the retort. 2 eq. of the crystallized Ferrocyanide ($Fe\ Cy_3, K_2 + 3\ Aq.$) are acted upon by 6 eq. of Sulph. acid ($S\ O_3, H\ O$). 3 eq. of water are decomposed. Of the 6 eq. of Cyanogen, 3 combine with 3 H to form 3 eq. of Hydrocyanic acid. The 3 O of the water unite with 3 K to form 3 eq. of Potash, which combines with the $6\ S\ O_3$ to form 3 eq. of Bisulph. Potash. 1 eq. of Potassium and 3 of Cyanogen remain ; these unite with 2 Fe to constitute 1 eq. of yellow Salt. This compound (K, Cy_3, Fe_2) is exactly the reverse of Ferrocyanide of Potassium, as regards the proportions of Potassium and Iron. 9 eq. of water are left. These somewhat complicated changes may be thus expressed by an equation.

$$2\,(FeCy_3, K_2 + 3\,Aq) + 6\,(S\,O_3, H\,O) = 3\,H\,Cy + 3\,(K\,O, 2\,SO_3) + (K, Cy_3, Fe_2) + 9\,Aq.$$

The constituents of yellow salt have been differently deduced by Gay-Lussac and Mr. Everitt; but the former having attended most to theoretical considerations, and the latter to the results derived from numerous experiments, his numbers are preferred, and are those adopted by Mr. Phillips. But Dr. Pereira, in repeating the experiments, agrees with Gay-Lussac in the colour of the salt, which the latter states to be white, while Mr. Everitt found it to be yellow. This he observed to be owing to the admission of air; for when the action was made to take place without the admission of the air, the salt precipitated was always white.

Adopting Berzelius' view of the composition of the Ferrocyanides, the proportion of the substances submitted to distillation, and the results where 6 equivalents of Sulphuric acid are heated with 2 equivalents of Ferrocyanide of Potassium, may be thus stated:

Submitted to Distillation.		*Results of Distillation.*	
6 eq. Sulphuric acid . .	240	3 eq. Bisulphate of Potash . .	384
4 — Cyanide of Potassium	264	3 — Hydrocyanic acid . . .	81
2 — Cyanide of Iron . .	108	1 — Cyanide Potassium 66 / 2 — Cyanide Iroh 108 (yellow salt)	174
12 — Water (6 in the acid, 6 in the salt)	108	9 — Water	81
	720		720

Tests. Besides ascertaining the strength of H Cy′, it is necessary to determine its purity.

L. E. It is colourless; entirely vaporizable, with a peculiar odour; slightly and transiently reddens litmus; is unaffected by Sulphuretted Hydrogen (showing absence of Bicyanide of Mercury, &c.) Solution of Chloride of Barium causes no precipitate. The presence of any other acid is indicated by the Iodo-cyanide of Mercury and Potassium (*v.* p. 219) being reddened, (in consequence of the formation of Biniodide of Mercury). The slight effect on Litmus, as well as the Chloride of Barium test, prove that there is no Sul′ or H Cl′.

To detect this acid in cases of poisoning, its odour is a delicate and usually very conspicuous test. The contents of the stomach may be washed and filtered; or, in cases of mixed fluids, these may be treated with animal charcoal without heat, neutralized with Sul′ if they are alkaline from Ammonia disengaged during putrefaction, and about 1-8th part distilled over in a vapour-bath, applying the following tests.

1. Supersaturate with solution of Potash, then add a solution of the salts of the mixed Peroxide and Protoxide of Iron (as common Green Vitriol, or the Tincture of the Sesquichloride), when a greyish-green precipitate is formed, which, on adding a little Sul′, becomes of a deep Prussian Blue colour. (For explanation of this test, *v.* p. 156.)

2. Nitrate of Silver causes a precipitate of Cyanide of Silver, which is soluble in boiling Nitric acid.

3. Sulphate of Copper, added in solution to Hydrocyanic′ supersaturated with Potash, forms a greenish precipitate, which, on the addition of a little Hydrochloric acid, becomes nearly white.

Consult works on Forensic Medicine, as of Christison and Taylor.

Action. Uses. Sedative and Anodyne. A powerful Poison. Useful in Chronic Coughs and in affections of the Heart, in painful Neuralgia, and Stomach complaints, as Gastrodynia. Externally as a wash to allay pain and irritation in chronic Skin Diseases.

D. ♏ij.—♏v. L., or ♏j.—♏ij. E. in an ounce or so of water or Emulsion. As a Lotion, fʒij. in Oß. of Rose-water or common Distilled water.

Antidotes. In cases of poisoning, it acts so quickly and energetically, that few antidotes can be effectively employed. 1. Cold affusion is usually most quickly available; and applied chiefly as cold *douche* to the Head and Spine, is particularly useful. 2. *Ammonia* or its Carbonate, cautiously inhaled, or in solution taken internally, or rubbed externally, is useful from its stimulant properties. 3. *Chlorine*, in the form of gas much diluted, cautiously inhaled, or Chlorine-water, in doses of a tea-spoonful or two, or the Chloride of Lime or of Soda, may be prescribed. Artificial respiration ought not to be neglected. When in time, it is best to give as a chemical antidote some solution of Carbonate of Potash, followed immediately by a solution of the mixed Sulphates of Iron.*

Myrtaceæ, *R. Brown.* Myrtle Family.

The Myrtaceæ are elegant in appearance. They abound in the tropical parts of New Holland and of America, are fewer in Asia and Africa, rare in the south of Europe. They secrete much astringent matter, as well as grateful Volatile Oil. Some therefore are employed as astringents, others as spicy aromatics. The fruit of some being berried, with a grateful acid and sweetish secretion, form edible fruits.

Tribe I. Leptospermeæ, *Dec.* Sub-tribe, *Melaleuceæ.*

Character of the tribe;—Fruit capsular.

Cajuputi, L. Cajuputi Oleum, E. Cajeputum, D. Melaleuca Cajaputi, *Maton* and *Roxb.*, D. M. Minor, *Sm.* L. Oleum e folio destillatum, L. Volatile Oil of the Leaves, E. *Polyadelphia Icosandria*, Linn. Cayaputi Oil, or Oil of Cajeput.

Cajuputi Oil, pronounced *Kayapootee* (meaning *Arbor alba*) in the East, appears to have been known only since the time of Rumphius,

* The Messrs. Smith of Edinburgh published in the *Lancet* of 5 Oct. 1844, detailed instructions for preparing a Prussic acid antidote, the supposed efficacy of which depends on the presentation to the acid of Iron in such a state of oxidation as to form with it the comparatively inert Prussian Blue. They have since given the following in the *Pharm. Journ.* v. 35, July, 1845.

Dissolve in a phial *Carbonate of Potash* (Salt of Tartar) grs. xx. in water f℥j. or f℥ij. Dissolve quickly in a mortar *Sulphate of Protoxide of Iron* in *water* f℥j. and add of *Tinct. of Sesquichloride* (Muriate) *of Iron* fʒj. and put in another phial. To prevent delay, let the dispenser go at once and himself give to the person who has taken Prussic acid, first the Potash solution, and immediately afterwards that of the salts of Iron.

who describes two trees. 1. *Arbor alba major*, H. A. ii. t. 16. 2. *Arbor alba minor*, H. A. ii. t. 17, f. 1. In 1798, Mr. Smith, of the Calcutta Botanic Garden, was sent to the Molucca Islands to obtain the true Cayaputi plant. He obtained several which were introduced into the above Garden, and have since been distributed all over India. It is curious that this species, though a native of Molucca, is able to stand the cold of N. W. India, probably owing to the thickness of its bark. Mr. S. having also sent specimens to this country, they were ascertained by Dr. Maton to be those of the second kind of Rumphius, and named *Melaleuca Cajaputi* in the London Pharm. for 1809, a name which Dr. J. E. Smith afterwards unnecessarily changed to *M. minor*. The other species, which the Malays also call Cayaputi,* is the *Melaleuca Leucadendron*, of which the leaves are larger, more falcate, 5-nerved, and smooth, but possess little or no fragrance, and are not known to yield any of this celebrated Volatile Oil.

Fig. 64.

Melaleuca Cajaputi, Roxb. (fig. 64), forms a small tree with an erect but crooked stem covered with thick, rather soft, light-coloured bark; branches scattered, with slender twigs which droop like those of the Weeping Willow. Leaves alternate lanceolate, acute, slightly falcate, 3 to 5-nerved, while young silky, and diffusing a powerful odour when bruised. Spikes terminal and from the extreme axils, downy as well as the calyx and branchlets, while in flower there is only a scaly conic bud at the apex, which soon advances into a leafy branchlet. Bracts solitary, 3-flowered. Calyx urceolate (fig. 64, 3), limb 5-parted. Petals 5, white, scentless. Stamens from 30 to 40, in five bundles; filaments 3 or 4 times longer than petals. Anthers incumbent with a yellow gland at the apex. Style long. Stigma obscurely 3-lobed. Ovary ovate, and

* In Murray, App. Medicam. we have it named *Caieput* s. *Kaiuput Oleum*.

like the capsule 3-celled (fig. 64, 2 and 1), many seeded, lower half united with, but the capsule is enclosed within the thickened tube of the calyx. Seeds angularly wedge-shaped. A native of the Molucca Islands, especially of Boerou, Manipe, and of the S. of Borneo. It is called *Daun. kitsjil,* but also Cajuputi.

The leaves are collected on a warm dry day in autumn, and placed in dry sacks, in which they nevertheless become heated and moist. They are next cut in pieces, macerated in water for a night, and then distilled. Two sackfuls of the leaves yield only about 3 drachms of the oil. This is clear and limpid, of a light green colour, very volatile, diffusing a powerful odour; having a warm aromatic taste, something resembling that of Camphor, followed by a sense of coolness. Sp. Gr. 0·914 to 0·927. It is soluble in Alcohol. It boils at 343°. When distilled with water, a light and colourless Oil first comes over, and then a green-coloured and denser Oil, which, with less odour, is more acrid. Comp., according to Blanchet, $C_{10} H_9 O = 77$. Some adulterations have been occasionally practised with this Oil, especially at the time when it reached a high price, when it was mixed with the Oils of Rosemary and of Camphor; but it is now commonly met with in a pure state, and without any admixture of Copper, such as has been suspected.

Action. Uses. Diffusible Stimulant, Antispasmodic; used externally in Rheumatism. Surprise was excited in India when Cayaputi Oil was stated to be a cure for Cholera, as Oil of Peppermint was there found equally useful.

D. ♏iij.—♏v. given on a lump of Sugar.

Tribe II. *Myrteœ.*

Character of the tribe :—Fruit baccate.

CARYOPHYLLUM, L. E. D. Caryophyllus aromaticus, *Linn.* Flos nondum explicatus, exsiccatus, L. Dried undeveloped Flowers, E. D. Cloves. *Icosand. Monog.* Linn.

Though it is doubtful whether the ancients were acquainted with the Clove, it is curious that the Arabs give *kurphullon* as its Greek name. P. Ægineta and Myrepsius seem to have known it; yet the author is of opinion that the ancients were not well acquainted with any substances produced further east than the coasts of the Bay of Bengal.

The Clove-tree is an evergreen, and, like others of the Myrtaceæ, elegant in appearance. It is like the Pimento. The wood is hard and covered with a smooth grey bark. The leaves opposite and decussate, ovate-lanceolate, tapering towards both ends, about 4 inches long, somewhat leathery, shining, and minutely dotted, diffusing a clove-like fragrance when bruised. Panicles short, trichotomously divided, jointed at every division. The calyx tube is cylindrical, of a dark purple colour, adhering to the ovary, divided into 4 ovate concave segments. Petals 4, overlapping each other and of a globular form when in bud, afterwards spreading, roundish, whitish, and said to exhale a grateful odour. Within the calyx and at the top of the ovary is a quadrangular disk, surrounding but not embracing the base of the short obtuse style. Stamens in 4 bundles,

filaments long, yellow. Ovary nearly cylindrical, 2-celled, with many small ovules in each cell attached to the sides of the dissepiment. Fruit a large elliptical berry, containing a single seed, by the growth of which the second cell and numerous ovules have been obliterated. Embryo large, elliptical, dotted. Cotyledons unequal, sinuose, the larger one partly enveloping the smaller, including the superior radicle.—See the Bot. Mag. t. ii. 749, for a full description; Dict. des Science, Nat. Bot., for detailed dissections. A native of the Moluccas, but confined by the Dutch to Amboyna and Ternate. It has, however, been introduced into the Isle of France, India, the West Indies and Guyana.

Cloves, the unexpanded flower-buds, are picked by hand or with long reeds, and then quickly dried in the shade. The best are obtained from the Moluccas. They have some resemblance to a nail, (whence the French name of *clou de girofle*), are usually of a dark-brown colour, with a pleasant odour, and a warm aromatic, even burning, taste. They have considerable weight. The best will exude a little Oil when pressed or scraped. Their active properties are extracted by water and by Alcohol. They consist, according to Trommsdorf, of Volatile Oil 18, a peculiar Tannin 13, Gum 13, Resin 6, Extractive 4, Lignin 28, water 18,=100. The Oil is officinal. The resinous principle has been named *Caryophyllin*, and is obtained in brilliant satiny crystals, without taste and without smell, fusible, volatile, insoluble in water, soluble in Alcohol; said to be isomeric with Camphor. The dried berries, called *Mother Cloves*, are still imported into China.

Action. Uses. Stimulant, Carminative. Used as a condiment and corrective, and for flavouring medicines.

OLEUM CARYOPHYLLI, L. E. D. Oil of Cloves.

Oil of Cloves is usually imported from Amboyna. In America it is said to be distilled from the Cloves grown in Cayenne. The Cloves from which oil has been distilled are apt to be intermixed with others. The Oil, when recent, is clear and colourless, but by degrees becomes of a dark-brown colour, which is its ordinary appearance. Its odour is strong, and its taste warm, aromatic, and even acrid. Sp. Gr. 1·05 to 1·06; being thus heavier, it sinks in water. It is best distilled with salt and water, as in the case of other heavy oils, and requires repeated cohobation. M. Ettling, according to Soubeiran, finds this Oil composed of—1. *A Hydrocarbon*, like Essential Oil of Turpentine, which is lighter than water. 2. *An oxygenated Oil*, which is heavy, Sp. G. 1·079, and has some of the properties of an acid (*acide eugenique* of Dumas), and composed of $C_{24} H_{15} O_5$. By mixing Oil of Cloves with Potash, the *light oil* may be distilled off from the *heavy oil*, which combines with the base; and the latter may subsequently be obtained by distilling its potash salt with Sulph. acid. 3. *Stearoptene*, which is also sometimes met with in distilled water of Cloves.

This Oil is sometimes mixed with Oil of Pimento.

Action. Uses. Aromatic Stimulant, Carminative, and used as a corrective in doses of ♏ij.—♏v.

INFUSUM CAROPHYLLI, L. E. D. Infusion of Cloves.

Prep. L. E. Macerate in a covered vessel for 2 hours *bruised Cloves* ʒiij. in boiling *Aq. dest.* Oj. Strain. D. ʒij. to f℥viij.

Action. Uses. A clear infusion, with the odour and taste of Cloves, incompatible with preparations of Iron. Useful as a warm carminative, or as a vehicle for other medicines, in doses of f℥iß.

Off. Prep. Mistura Ferri Arom. D. Inf. Aurantii Comp. L. E. D. Sp. Ammoniæ Arom. L. Sp. Lavandulæ, Comp. E. D. Vinum Opii, L. E. Conf. Aromatica, L. D. Pil. Colocynth. Comp. E. D. Confect. Scammonii, L. D.

PIMENTA, L. E. D. Eugenia Pimenta, *Linn.* Fructus immaturus, L. Unripe Berries, E. D. Pimento. *Icosand. Monog.* Linn.

A native of South America and the West Indies. In the latter it is much cultivated in regular walks. Besides Pimento, it is also called Allspice and Bay-berry tree.

An elegant tree about 30 feet high, foliage dense and evergreen, branches round, twigs compressed, the younger as well as the pedicels pubescent. The leaves are petiolate, oblong or oval, marked with pellucid dots, smooth. The peduncles axillary and disposed in terminal trichotomous panicles. Calyx and petals 4-fid, the latter reflected greenish white. Stamens numerous. Ovary 2—3-celled; cells many ovuled. Berry spherical covered by the roundish persistent base of the calyx, which when ripe is smooth, shining and of a dark purple colour; 1-, rarely 2-celled; 2-seeded. Embryo roundish, cotyledons united into one mass, radicle scarcely distinct.—Nees von E. 298. *Myrtus* or *Myrcia pimentoides* is figured in t. 297, and yields ovate Pimento.

Browne (*Nat. Hist. of Jamaica*) describes the berries as being gathered before they are ripe, because they then lose their aromatic warmth, acquire a taste like Juniper-berries, and are much eaten by birds. When gathered, they are carefully dried in the sun. They are round, rugose, unequal in size, of a brownish colour; and consist of the pericarp, in which the virtues chiefly reside, and of two dark-brown seeds. The odour is strongly fragrant, and the taste warm and aromatic. This depends on a Volatile Oil, which is separated by distillation. There is also some Fixed Oil, a pungent Resin, Extractive, Tannin, Gallic acid, &c.

Action. Uses. Stimulant Aromatic. Carminative in doses of gr. x.—ʒß.

OLEUM PIMENTÆ, L. E. D. Oil of Pimento.

Obtained in the proportion of 1 to 4 per cent. by distilling bruised Pimento with water. It resembles and is sometimes sold for Oil of Cloves, or employed to adulterate it. Dr. Pereira describes it as consisting of two Volatile Oils, one *light* (Hydrocarbon), the other *heavy* (Pimentic acid). It produces a red colour with Nitric and a bluish-green with Tinct. of Sesquichloride of Iron; thus resembling Morphia in these particulars.

Action. Uses. Stimulant Carminative in doses of ♏iij. to ♏vj. Rubefacient externally.

Spiritus Pimentæ, L. E. Spirit of Pimento.

Prep. L. Dissolve *Oil of Pimento* f℥ij. in *Proof Spirit* Cj. E. Proceed as for Spirit of Carraway, using *bruised Pimento* ℔ß.

Action. Uses. Carminative, in doses of f℥j.—f℥iv. Used chiefly as an adjunct.

Essentia Pimentæ, D. Essence of Pimento.

Prep. Mix with agitation *Oil of Pimento* f℥j. with *Rect. Spirit* f℥ix.

Aqua Pimentæ, L. E. D. Distilled Water of Pimento.

Prep. L. Mixed *bruised Pimento* ℔j. with *dist. water* Cij. and distil off Cj. Or prepare with the oil, as Aq. Anethi. E. Similar. D. f℥j. of the *Essence* is mixed with *dist. water* Cß. and filtered.

Action Uses. Carminative. Much used as a vehicle for other medicines in doses of f℥iß.

Off. Prep. Syrupus Rhamni, L. E.

Granateæ, *Don.* Pomegranates.

This order was instituted by the late Professor Don for the Pomegranate, which was usually included, as it still is by Dr. Lindley, among Myrtaceæ. It is chiefly distinguished by its leaves not being dotted, by the want of the marginal vein, by the peculiarities of its fruit, by the seeds being involved in pulp, and by its cotyledons being convoluted; also by the absence of aromatic properties, and the geographical distribution being beyond the range of tropical Myrtaceæ. Dr. L. thinks that the several variations are not greater than occur in genera of other families, without their being raised to the rank of orders.

Granatum, L. E. Punica Granatum, *Linn.* Fructûs cortex. Rind of the fruit. *Icosand. Monogyn*, Linn. Pomegranate.

Granati Radix, L. E. D. Radicis cortex. Bark of the Root of Pomegranate.

The Pomegranate, a native of the mountainous countries from Syria to the north of India, must always have been an object of attention. It is the *rimmon* of the Bible, and the *rooman* of the Arabs. It was well known to the Greeks and Romans.

Stem arborescent and irregular, in arid situations rather thorny; the leaves usually opposite, often fascicled, oblong, inclining to lanceolate, quite entire, not dotted, smooth, shining, and of a dark green; flowers commonly solitary, of a brilliant scarlet; calyx thick and fleshy, adhering to the ovary, turbinate, 5- to 7-cleft; petals 5 to 7, crumpled; stamens numerous, often double; style filiform; stigma capitate; fruit of the size of a large apple, with a thick leathery rind, and crowned by the tubular limb of the calyx; cells several, arranged in two strata, separated from each other by an irregular transverse diaphragm, lower division of 3 cells, the upper of from 5 to 9 cells; seeds numerous, involved in pellucid pulp, with foliaceous, spirally convolute cotyledons.—Nees von E. 301.

The parts of this plant which were employed by the ancients are all still used in the East. Thus the Flowers are the *Balaustion* of the ancients. In India, *buloositoon* is given as the Greek name of the double flower. They are devoid of odour, but have a bitterish and astringent taste, tinge the saliva of a reddish colour, contain Tannin, and strike a black with ferruginous salts. They are not now officinal.

Fig. 65.

The Rind of the Fruit (*Granatum*, L. E.), especially of the *wild* plant, is extensively employed as an astringent and as a dye in the East. It is of a reddish-brown colour and smooth externally, but yellow on the inside; occurs usually in irregular fragments, dry, hard, and leathery, of a very astringent taste. It contains of Tannin 18·8 per cent., with 10·8 of Extractive, and 17·1 of Mucilage, and is used for tanning in some countries.

The Bark of the Root (*Granati Radix*, L. E. D.) was employed as an anthelmintic by Dioscorides and Celsus, and still is so in India. It was reintroduced into practice by Drs. Buchanan and Anderson. The root itself is heavy, knotted, and of a yellow colour; its bark is often sold in strips, sometimes with parts of the root still adhering to it. On the outside it is of a greyish-yellow colour; on the inside, yellow, something like that of the barberry. It has little smell; when chewed, colours the saliva yellow; and has an astringent taste, without any disagreeable bitterness. It has been analyzed by

Mitouart, Latour de Trie, and others; but the source of its peculiar anthelmintic powers has not been satisfactorily ascertained, and the subject requires further investigation. It contains Tannin (about 20 per cent.), Gallic acid, Resin, Wax, Fatty matters, and Mannite. "An infusion yields a deep-blue precipitate with the salts of Iron, a yellowish-white one with solution of Isinglass, and a greyish-yellow one with Corrosive Sublimate; and Potash or Ammonia colours it yellow." (*c.*) The substance discovered by Latour de Trie, and which he called *Granadine*, supposing it to be peculiar to this root-bark, has been since proved to be *Mannite*. But later investigators have indicated the presence of a peculiar acrid principle in this bark when fresh, which is said to have basic properties, and is called *Punicine*.

It is apt to be adulterated with the barks both of box and of barberry. The former is white and bitter, but not astringent; the latter yellow, very bitter, and not similarly affected by the above four reagents.

Action. Uses. All parts are astringent, (the rind of the wild fruit especially so), and useful in Diarrhœa and advanced stages of Dysentery; the Flowers in infusion are slightly astringent; the Bark of the Root astringent, but remarkably useful as an Anthelmintic for the expulsion of tænia.

D. It may be given in doses of ℈j. in powder; or when given for Tapeworm, a decoction may be formed by steeping for 12 hours *fresh Root-bark of Pomegranate* ℥ij. in *Aq.* Oiß., and then boiling down to Oj. Of this f℥ij.—f℥iv. may be given in the morning fasting, and repeated every two hours, until three or four doses have been taken; pursuing the same course another day, if it do not act at first, and giving occasional doses of Castor Oil.*

DECOCTUM GRANATI, L. Decoction of Pomegranate-rind.

Prep. Boil *Pomegranate rind* ℥ij. in *Aq. dest.* Oiß. down to Oj., and strain.

Action. Uses. Astringent. D. f℥j.—f℥iv.

DECOCTUM GRANATI RADICIS, L. Decoction of Pomegranate-root.

Prep. Boil sliced *Pomegranate-root* ℥ij. in *Aq. dest.* Oij. down to Oj., and strain.

This is useful especially as an Anthelmintic, and given as prescribed above.

* Dr. Budd, Physician of King's College Hospital, informs the author that he has often prescribed the bark of the root of Pomegranate, and that he considers it as efficacious as Turpentine, and much safer, producing only a feeling of weight in the stomach, or nausea, apparently on account of the quantity taken. Dr. Budd insists, as some others have done, upon the *fresh* root only being employed.

Cucurbitaceæ, *Juss.* Gourd Family.

The Cucurbitaceæ abound chiefly in warm parts of the world, but a few are found in temperate climates. A bitter, often purgative, principle is secreted by many of them; several by cultivation yield edible fruit, but even in these the rind continues bitter. The seeds contain much bland fixed oil.

Colocynthis, L. E. D. Citrullus Colocynthis, *Schrad.* L. *Cucumis Colocynthis*, Linn. E. D. Fructus decorticatus, L. Pulp of the Fruit, E. D. Colocynth. *Monœcia Monadelphia*, Linn.

The Colocynth (*κολυκυνθίς* of the Greeks and *Hunzal* of the Arabs) has been used in medicine from the earliest times, and is one of the plants supposed to be the *Pakyoth* or *wild gourd* of Scripture.

Fig. 66.

Citrullus Colocynthis.

Annual Herb. Roots thick, whitish. Stems procumbent, angular, hispid. Leaves cordate-ovate, divided into many lobes; lobes obtuse (but rather acute in the Linnæan specimen, and as represented by St. and Ch. iii. t. 138, from a plant grown in Chelsea Garden from seed sent from the Mediterranean, and from which fig. 66 is taken), of a bright green on the upper surface, whitish below, and muricated, from being covered with small white hairs and often hair-bearing tubercles. Petioles as long as the lamina. Tendrils short. Flowers axillary, solitary, stalked. Calyx with 5 subulate segments. Female flowers with the tube of the calyx globose, and somewhat hispid, the limb campanulate, with narrow segments. Petals small, yellow, with greenish veins, scarcely adherent to each other and to the calyx. Fruit globose, smooth, about the size of an orange, with a thin but dense rind, 6-celled, pulp very bitter. Seeds ovate, not marginate, whitish, sometimes brownish, bitter.—Extending from the south of Europe to Syria and the south of India,* north of Africa, Egypt, and Nubia.

* Found in various parts of India, as on the sandy lands of Coromandel (*Roxburgh*), Peninsula (*Wight*), Deccan (*Col. Sykes*), sea-shores of Guzerat (*Gibson*),

It is possible that in some of the localities usually cited, some nearly allied species may be found instead of the true Colocynth.

Colocynth is imported in two forms. 1. *Unpeeled*, from Mogadore, in its entire state, and covered by its hard yellow rind. 2. *Peeled*, from the Levant, North of Africa, and South of Spain; with the rind peeled or pared off, and the pulp dried when the fruit is ripe. It then appears in the shape of white balls, which are light, porous, and spongy, but tough, usually with the seeds forming about $\frac{3}{4}$ of the whole weight. The smaller variety of fruit is considered the best, and is sometimes imported with the seeds removed. This is always required to be done before any preparations can be made. The decorticated fruit is officinal in the L. P.; the pulp of the fruit only, in the E. and D. P. The seeds are bitter; but a good deal of the bitterness may be removed by repeated washings in water. The pulp is without odour, but nauseously and permanently bitter. It is with difficulty reduced to powder, and may therefore with a magnifier be seen in pills which have been made up with the pulp instead of from the Extract. Both water and Alcohol extract its active properties. Analyzed by Meisner, the pulp was found to contain of Fixed Oil 4·2, Bitter Resin, 13·2, Bitter Principle (*Colocynthin*) 14·4, Extractive 10, Gummy matters 30, Phosphate of Lime and Magnesia, 5·7, Lignin 19·2. The *Colocynthin* is probably not a pure vegetable principle. Examined by Herberger and Braconnot, it proved of a reddish-yellow colour in mass, but yellow when in powder, transparent and friable, excessively bitter, burning like a resin, soluble in five parts of cold and in less boiling water; equally soluble both in Alcohol and Ether. Acids and the deliquescent salts precipitate it as a coherent and viscid mass; alkalis do not precipitate it, neither does Gall-nut when it is quite pure. It contains Nitrogen, and, according to Braconnot, restores the colour of Litmus reddened by acid. (*Soubeiran*).

Action. Uses. Colocynth is a powerful Hydragogue Cathartic, but an irritant Poison in large doses.

EXTRACTUM COLOCYNTHIDIS, L. E. Extract of Colocynth.

Prep. L. Macerate *Colocynth* cut in pieces (rejecting the seeds) ℔iij. in (cold) *Dist. water* Cß. for 36 hours, frequently pressing it with the hand. Press out the liquor strongly, and filter; lastly, evaporate to a due consistence.

E. Boil *Colocynth pulp* ℔j. in *water* Cij. gently for 6 hours, replacing occasionally the evaporated water. Strain hot, and evaporate.

The L. P. of 1836 employed too much water, and ordered boiling, like the E. C. now. By this means a large quantity of slimy mucus was taken up, and

Kaira (*Burns*), and near Delhi (*Mackintosh and Rankin, v.* Bengal Dispensatory —also *Falconer*). The author has heard of it in this direction, but on sending for *Indrayun* and *Bisloombha* plants, which are Arabian and Indian names for the Colocynth, a specimen of a nearly allied species, with oval instead of globular fruit, was obtained. This he named *C. Pseudo-Colocynthis*, and figured (Himal. Bot. t. 47, fig. 2). A good supply of Colocynth may therefore be obtained for the public service or for commerce, from India, whence indeed it has sometimes been imported. Dr. Stocks has lately sent some of the Extract from Bombay.

the Ext. was apt to become mouldy. Now almost too little water is ordered. Mr. Squire recommends that this extract be prepared with Proof Spirit.

Action. Uses. Cathartic, but seldom prescribed alone, though it may be given in doses of gr. v. to ℈j.

PILULA COLOCYNTHIDIS COMPOSITA, L. D. Pilulæ Colocynthidis, E. Compound Colocynth Pill.

Prep. L. Mix together *powdered Ext. of Aloes* ʒvj. *powdered Scammony* ʒij. *powdered Cardamom* ʒß.; add *Ext. of Colocynth* ʒj. and *Soft Soap* ʒiß.; and beat all together, that a pill-mass may be made. (This Pill is substituted for the *Ext. Coloc. co.* of the L. P. of 1836).

E. *Colocynth,* 4 parts, *Socotrine Aloes* and *Scammony,* āā 8 parts, *Sulphate of Potash* and *Oil of Cloves,* āā 1 part, with *Rect. Spirit* q. s.

D. Similar to E.; no Sulph. Potash.

Action. Uses. As Colocynth taken alone is much more griping and irritating than when prescribed with other Cathartics, the Compound Pill (late *Extract*) is a safe and energetic purgative, and probably more frequently prescribed than any other combination. The addition of a little Calomel makes it still more useful.

D. gr. v.—xv.

PILULÆ COLOCYNTHIDIS ET HYOSCYAMI, E. Colocynth and Henbane Pills.

Prep. Beat together *Colocynth Pill-mass,* 2 parts, *Extract of Henbane,* 1 part, adding, if necessary, a few drops of *Rectified Spirit.* Divide into 5 gr. pills, of which one to three form a dose.

Action. Uses. The addition of the Henbane deprives the pill of its tendency to gripe and irritate, and therefore makes this form applicable to all the same cases as the above.

ENEMA COLOCYNTHIDIS, L. Colocynth Enema.

Prep. Mix and rub together *Extract of Colocynth* ʒß. *Soft Soap* ℥j. *Aq.* Oj.

Action. Uses. Cathartic Enema in obstinate constipation.

A *Tincture* and a *Wine of Colocynth* are employed sometimes on the Continent. A little of the former, or ℈j. of the powder mixed with lard, and rubbed on the abdomen, will sometimes produce a full cathartic effect.

ELATERIUM, L. E. D. Ecbalium officinarum, *Rich.* L. *E. agreste,* D. Fructus recens, tantum non maturus, L. Feculence of the juice of the Fruit, E. D. *Momordica Elaterium,* Linn. Squirting Cucumber.

This plant was known to the Greeks, and called Σίκυς ἄγριος and sometimes Ἐλατήριον, a name which was also applied to the feculence of the juice of its fruit. By Richard it has been formed into a genus ECBALIUM, and the species called E. officinarum. (*E. agreste, Rchb.*)

Annual, with hispid, scabrous, trailing stems, which are glaucous and without tendrils. Leaves cordate, somewhat lobed, crenately toothed, very rugose, on long bristly stalks. Flowers monœcious. ♂ Calyx 5-toothed. Corolla yellow, 5-parted. Stamens triadelphous, with connate anthers. ♀ Filaments 3, sterile. Style trifid. Stigmas bifid. Ovary 3-celled, with many ovules. The fruit ovate, $1\frac{1}{2}$ inch long, muricated,—when mature, being freed from its petiole, and contracting with elasticity, it forcibly projects the juice and seeds from a basilary orifice. Seeds of a brown colour, compressed, reticulate.—A native of the south of Europe, cultivated in England..—Esenb. and Eberm. 272. St. and Ch. i. 34.

Fig. 67.

Ecbalium officinarum, *Rich.*

The Elaterium of the L. P. is the unripe fruit of this plant. The E. and D. C. apply that name to the feculence deposited from the juice of the fruit, when separated and allowed to stand. This last is the *Extractum Elaterii* of the L. C. Dr. Clutterbuck has proved that it is contained only in the juice around the seeds, which is of a gelatinous consistence. The rest of the fruit is comparatively inert. When the fruit is sliced and placed upon a sieve, a limpid and colourless juice flows out, which after a time becomes turbid, and then deposits a sediment. This, when dried, is light and pulverulent, of a light yellowish-white colour tinged with green, and is genuine Elaterium, of which Dr. C. obtained only 6 grains from 40 of these Cucumbers; and found $\frac{1}{8}$ of a grain to produce powerful cathartic effects. The method now adopted for obtaining Elaterium is in conformity with these experiments. The processes of the three Colleges are nearly the same; the fruit is ordered by the L. C. to be *just unripe*, because if only the *quite ripe* fruit is collected, the greater part of the active principle would in most cases be expelled by the peculiar method in which this plant discharges its seeds.

Extractum Elaterii, L. Elaterium, E. D. Elaterium, or Extract of Elaterium.

Prep. L. Slice the *fruit of the Squirting Cucumber,* before it is quite ripe, in the long direction; and strain the juice, very gently expressed, through a very fine hair sieve; then set aside for some hours, until the thicker part has subsided. Reject the thinner supernatant fluid, and dry the thicker part (feculence) with a gentle heat. E. D. Similar.*

Tests. Colour pale greenish-grey; when exhausted by rectified Spirit, the solution concentrated, and poured into hot diluted Liquor Potassæ, there are deposited on cooling minute, silky, colourless crystals, weighing about 26 per cent. of the Elaterium, E. The Spirit dissolves the active principle (*Elaterin*) with Chlorophyll: the latter is retained.

Elaterium is in thin cakes of a pale-grey or greenish-grey colour, often marked by the substance upon which it has been dried; light and friable, with little odour, but with an acrid and bitter taste, which is possessed by other parts of the plant, as the leaves. An *inferior kind* is also met with, which is more compact, of a darker colour, and either brownish or of an olive-green. This is probably prepared by expressing the whole juice, and then evaporating to dryness. Dr. Pereira describes *Maltese Elaterium* as in larger flakes, and of a paler colour, often chalky, sometimes mixed with Starch; hence effervescing with acids, and becoming blue with Iodine. Elaterium, carefully prepared, consists only of the feculence deposited when the juice has been exposed, in which some change is supposed to take place from the influence of the air. Alcohol is its best menstruum, dissolving from 50 to 60 per cent. of good Elaterium. It was first analysed by Dr. Paris; who discovered an active principle which he named *Elatin.* This was found by Mr. Morris of Edinburgh, and by the late Mr. Hennell, to be composed of a peculiar principle, *Elaterin,* and of a green Resin. Elaterium also contains Bitter matter, Starch, Woody fibre, and Saline matters: but the proportion of Elaterin is very uncertain, varying from 5 to 44 per cent. in different specimens, probably according to the method of preparation and the goodness of the fruit. Elaterin may be obtained by the E. P. process for ascertaining the purity of Elaterium.

Dr. Christison, who states that he witnessed the experiments of Mr. Morris Stirling, describes *Elaterin* as consisting of very delicate colourless, striated, satiny, prismatic crystals, with a rhombic base, permanent in the air, without odour, but of an intensely bitter and somewhat acrid taste. It fuses a little above 212°, and by a strong heat is decomposed with the evolution of ammoniacal smoke. It is soluble in rectified Spirit, Ether, fixed oils, and weak acids, but not in water or weak alkalis.

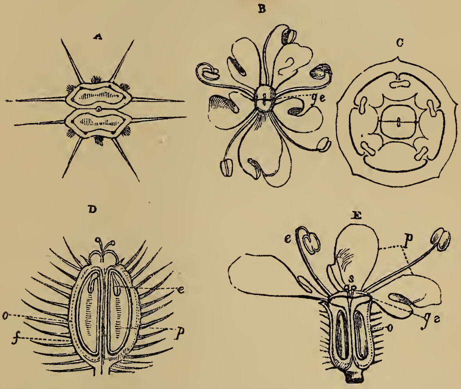
* At the Mitcham gardens Elaterium is manufactured very much in the above way, only that considerable force is used in the expression of the juice, and the product therefore less potent, though more in quantity. The manufacture usually commences about the second week in September.

Action. Uses. Powerful Hydragogue Cathartic; apt to create nausea and vomiting; in large doses will act as an irritant poison, producing inflammation of the intestinal canal. Useful in procuring copious watery evacuations in Dropsy, and as a revulsive in Cerebral affections.

D. Good Elaterium will act effectively in doses of $\frac{1}{8}$ or even $\frac{1}{16}$ of a grain: but being generally inferior, gr. ß.—gr. j. or more, is prescribed every other day with a bitter Extract. *Elaterin* dissolved in Rectified Spirit may be given in $\frac{1}{16}$ grain doses.

UMBELLIFERÆ, *Juss.* Umbellifers. *Pentand. Digyn.* Linn.

Fig. 68. (*v.* p. 277.)



68. *Daucus Carota.* C. Plan of the flower. B. Flower seen from above. *g. e.* Disk. E. Vertical section of the flower. *p.* Petals. *e.* Stamens. *o.* Ovary adherent to the calyx. *s.* Styles and stigma. *g. e.* Disk. D. Vertical section of the fruit. *f.* Pericarp. *o.* Seed. *p.* Albumen. *e.* Embryo. A. Horizontal section of the fruit; primary ridges projecting into prickles, and alternating with the bristly secondary ridges.

The Umbelliferæ are allied to Araliaceæ and to Saxifrageæ, also to Ranunculaceæ, and likewise to Corneæ. They are natives chiefly of the northern parts of the northern hemisphere, but many of them exist in the Persian region and in the Himalayan mountains. Volatile Oil is the chief secretion of this family, and abounds most in the fruits, commonly called *seeds.* These are frequently employed as Carminatives. When the oil is diffused through the herbaceous parts, the plants are employed as culinary herbs. A Gum-resin exudes from some of them in the warm and dry Persian region, while others, growing chiefly in moist situations, are possessed of poisonous properties. These may be distinguished from the wholesome species by the absence of the aromatic odour.

Tribe *Ammineæ*. Fruit laterally compressed or didymous.

CARUI, L. E. D. Carum Carui, *Linn.* Fructus; the fruit, or *seeds*. Common Caraway.

Caraway was known to the Greeks, being a native of most parts of Europe.

Biennial, about 2 feet high. Root fusiform. Leaves bipinnate. Leaflets cut into linear segments. Involucre wanting, or of one leaf. Involucel none. Cal. obsolete. Pet. obcordate, with a narrow acute inflexed point. Fruit aromatic, oblong, a little curved, brownish-coloured. Carpels with 5 filiform ridges. Interstices with single vittæ.—Stylopodium depressed.—Meadows and pastures: cultivated in Essex. E. B. t. 395.

The fruits of the Caraway, or Seeds, as they are commonly called, have a pleasant odour and a warm aromatic taste, owing to the presence of about 5 per cent. of Volatile Oil, which may be dissolved out of them by Alcohol, or distilled off with water.

Action. Uses. Stimulant Carminative, much used in Confectionary. Its Oil and Spirit used as Corrective Adjuncts, the water as a vehicle.

OLEUM CARUI, L. E. D. Oil of Caraway.

Obtained by distilling with *Aq.* the fruit of *Carum Carui.*

SPIRITUS CARUI, L. E. Spirit of Caraway.

Prep. L. Dissolve *Oil of Caraway* f℥ij. in *Proof Spirit* Cj.
E. Take *bruised Caraways* ℔ß., *Proof Spirit* Ovij. Mix. Macerate for two days in a covered vessel; add *Aq.* Ojß. Distil off Ovij.

ESSENTIA CARUI, D. Essence of Caraway.

Prep. Mix with agitation *Oil of Caraway* f℥j. and *Rectified Spirit* f℥ix.

AQUA CARUI, L. D. Caraway water.

Prep. L. Same as Aq. Anethi.
D. Mix with agitation *Essence of Caraway* f℥j. and *Dist. water* Cß. Filter through paper.

ANISUM, L. E. D. Pimpinella Anisum, *Linn.* Fruit. Anise.

Anise (ἄνισον), being a native of the Grecian Archipelago, was well known to the ancients.

Stem about a foot high, smooth. Radical leaves heart-shaped, rather roundish, lobed, incised; stem leaves biternate. Segments linear, lanceolate, rather wedge-shaped, acuminate. Umbels on long stalks, many rayed, without involucres. Flowers small, white. Calyx obsolete. Petals obcordate, with an inflexed point. Fruit ovate 1½ line long, covered with a few scattered hairs. Carpels with 5 filiform equal ridges. Interstices with 3 or more vittæ. Stylopodium tumid. Styles of the fruit recurved.—Nees and Eberm. 275.

The fruit, commonly called *Aniseed*, is ovoid, of a greenish-grey colour, and slightly downy; the taste is warm, sweetish, and aromatic,

the odour penetrating but agreeable, in both resembling the Star-anise (p. 292). It is cultivated in Malta and the south of Spain, and also in Germany. The kernel contains 3·5 per cent. of fixed oil, and the inner firmly-adhering seed-coat about 3 per cent. of *Volatile Oil of Anise*, on which its properties chiefly depend.

Action. Uses. Agreeable Carminative, and much used for flavouring condiments.

Oleum Anisi, L. E. D. Oil of Anise.

This, obtained by distillation with water from Aniseed, is of a bright yellow colour. It has the strong odour and taste of Anise. Much is imported from abroad; but that which is said to come from the East Indies is probably produced by some other plant. It solidifies very readily at 50°, from containing a large proportion of Stearoptene.

Action. Uses. Stimulant Aromatic, Stomachic. In flatulent colic, in doses of ♏v.—♏xv.

Spiritus Anisi, L. Spirit of Anise.

Prep. Dissolve *Oil of Aniseed* f℥ij. in *Proof Spirit* Cj.

Essentia Anisi, D., is prepared as *Essent. Carui.*

Aqua Anisi, D. Anise-water.

Prep. As *Aq. Carui*, D.

Tribe *Seselineæ.* Section of the fruit rounded or roundish.

Fœniculum, L. E. D. Fœniculum dulce, L. Sweet Fennel. F. officinale, E. D. Common Fennel. Fructus ; the fruit, or *seeds.*

Fennel being found all over Europe, was known to the Greeks, and called *μάραθρον.*

The fruit of wild Fennel has a strong, rather disagreeable odour, and an aromatic but acrid taste. Its properties depend upon a Volatile Oil of a pale yellow colour. Dr. Pereira has remarked that the common Fennel is not employed in medicine, and thus the two Colleges err in quoting it; but as decoction of Fennel *seeds* is sometimes employed as an Enema in the flatulent colic of children, those of the wild plant are well suited for this purpose. For internal exhibition, the Sweet Fennel is alone eligible. Some botanists consider this only as the cultivated variety of the Fœniculum vulgare; but others account it a distinct species.

Fœniculum dulce. *C. Bauh. Dec.* Sweet Fennel.

Stem somewhat compressed at the base. Radical leaves somewhat distichous. Segments capillary, elongated. Umbels of 6 to 8 rays. *Dec.* This is, moreover,

smaller than the wild plant, and an annual; but its fruit is much larger, some nearly 5 lines in length, less compressed, somewhat curved and paler, with a greenish tinge.—A native of the south of Europe, cultivated in gardens as a pot-herb and for garnishing (*Finnochio dulce,* turionibus edulibus). Dr. Pereira long since favoured the author with the two kinds; the more agreeable taste and odour of this kind are, as he describes, very decided. Care therefore must be taken in determining which kind of fruit is used in the following preparations.

Action. Uses. Stimulant Carminative. Sometimes used in Flatulent Colic.

OLEUM FŒNICULI, L. E. D. Oil of Fennel.

Prep. Distil the fruit of *Fœniculum dulce* or *officinale* with *Aq.*

ESSENTIA FŒNICULI, D., is prepared in the same way as *Essent. Carui.*

AQUA FŒNICULI, E. D. Fennel Water.

Prep. E. Take *Fennel* and prepare as Aq. Anethi.
D. As *Aq. Carui,* D.

Tribe *Angeliceœ.* Fruit much and dorsally compressed, with a double wing on each side.

ANGELICA, E. The root of Archangelica officinalis, *Hoffm.* Garden Angelica.

This plant has long been employed in medicine; but is a doubtful native of this country.

A biennial plant. Root large, pungently aromatic. Stem 3 or 5 feet high, hollow, striated, rather glaucous. Foliage, stalks, and even flowers of a bright green. Leaves 2 or 3 feet wide, bipinnated or biternate. Leaflets ovate, lanceolate, sharply and closely serrated, all sessile, partly decurrent, terminal one trifid. Petioles much dilated at the base. Umbels terminal, globular, with dense secondary umbels. Involucre of 2 or 3 linear bracts, secondary one of about 8 linear-lanceolate bracts. Calyx minutely 5-toothed. Petals ovate, entire, acuminate, incurved. Fruit nucleated. Carpels or half-fruits with 3 dorsal thick-keeled ridges, and 2 marginal ridges dilated into broad wings. Interstices without vittæ. Seed free, with numerous vittæ.—Native of watery places in the northern parts of Europe.—E. B. t. 2561. Nees and Eberm. 279, 280.

The whole plant when bruised diffuses a strong and rather grateful odour. The root, when wounded in the spring, exudes an odorous yellow juice: when dried, the root is wrinkled, of a greyish-brown externally, and white in the inside; it has a warm and bitterish taste. The stem and leaf-stalks, cut in May, when they are tender, are made into a preserve with Sugar. The fruits have the same odour and taste, depending on the presence of a Volatile Oil and a Resin, as well as of a Bitter Extractive. The other ingredients of the root are Gum, Starch, water, and woody fibre. "The best way to preserve it, is to pulverize it, and to pack the powder firmly in bottles." (*c.*)

Action. Uses. Aromatic Stimulant, but little used; Stomachic. An infusion of the Root or Fruits (ʒij.—Aq. Oj.) may be given.

Tribe *Pencedaneæ.* Fruit much and dorsally compressed, with a single wing on each side, which is flat or thickened towards the edge.

ANETHUM, L. E. Anethum graveolens. *Linn.* Fructus; the Fruit. Common Dill.

Dill (*ἄνηθον*), a native of the south of Europe and of the Oriental region, was well known to the ancients.

Annual, 1 to 2 feet high, every part smooth and glaucous, stem finely striated. Leaves tripinnated, with fine capillary segments like those of the Fennel, petioles broad and sheathing at the base. Umbels long-stalked, without general or partial involucres. Calyx-margin obsolete. Petals varnished, yellow, roundish, entire, involute. Fruit lenticular flat, of a bright brown colour on the rather convex back, surrounded by a pale membranous margin. Carpels or half fruits with equidistant filiform ridges, the 3 dorsal acutely keeled, the 3 lateral more obsolete, and passing into the margin. Vittæ broad, solitary, filling the whole channels, 2 on the circumference.—Much cultivated in the East, and also in this country.—St. and Ch. iii. t. 137.

The flattened elliptical fruits, commonly called seeds of the Dill, with their brown and slightly convex backs and pale membranous margin, are easily distinguished from the other officinal fruits. Both the plant and the fruit are much used in the East as condiments and articles of diet. The plant is hence mentioned in the New Testament among the things tithed; but it is translated Anise. The carpels have a bitter but aromatic taste, owing to the presence of volatile oil which is stored up in the vittæ, making them useful as Carminatives.

OLEUM ANETHI, L. E. Oil of Dill.

Prep. Distil with *Aq.* the bruised fruit of *Anethum graveolens.*

Action. Uses. Odour and taste aromatic. Used for making Aqua Anethi. Carminative in doses of ♏v.

AQUA ANETHI, L. E. Dill Water.

Prep. L. Mix bruised *Dill* ℥xviij. with *water* Cij. Distil Cj.
Or else, triturate briskly *Oil of Dill* f℥ij., first with *powdered Flint* ℥ij., then with *Dist. water* Cj., and filter through paper.
E. Like the first mode.

Action. Uses. Aromatic, given to infants to relieve Flatulence, and used as a vehicle for more active medicines.

The FŒTID GUM RESINS, as they are called, or *Opopanax*, *Assafœtida*, *Sagapenum*, *Galbanum*, and *Ammoniacum*, are all produced within the limits of the Persian region of botanists. Though the plants producing them are not accurately known, they are supposed mostly to belong to this tribe of Umbelliferæ; but Galbanum officinale belongs to Silerineæ.

Opopanax. A Gum-Resin.

Opopanax is described by Dioscorides as the produce of πάνακες Ἡράκλειον, a plant of Bœotia and Arcadia, which has been identified with the present *Opopanax Chironium*, referred by Sprengel to the genus Ferula. It is found also in the open fields of the south of France, of Italy, Sicily, and Greece, and, according to Merat and De Lens, also in Syria and the East. Dodoens first grew this plant from seeds found attached to pieces of Opopanax; and he states that when wounded in warm weather, especially near the root, a juice exudes, which concretes into a gum resembling Opopanax. But there is no proof that this plant yields the Opopanax of commerce, which reaches India either from the Persian Gulf or the coast of Arabia, and is called *juwa sheer*, or the milk of *juwa*, as it was by Serapion. Dr. Lindley describes (Fl. Med. p. 100) the fruit of a species of Ferula, which he names *F. Hooshee*, and of which the produce (which, however, is not collected) is said to resemble the Opopanax, according to a letter from Mr. Macneil. Opopanax is imported into this country from Turkey; in the time of Mathioli it was obtained from Alexandria.

Opopanax occurs in irregular-shaped but usually angular pieces of a reddish-yellow colour, sometimes speckled with white from the interior having become recently exposed; of a strong, rather fœtid odour, and of a bitter acrid taste. Sp. Gr. 1·62. It is composed chiefly of Resin and Gum, with 5·9 per cent. of Volatile Oil, which may be separated by distillation. It will form an emulsion with water.

Action. Uses. Antispasmodic. It formerly enjoyed a high repute, as its name indicates, and was an ingredient of the Theriaca. It is not now officinal.

Sagapenum, L. Planta incerta: Gummi-resina. Sagapenum.

Sagapenum, like Opopanax, has been known to us since the time of the Greeks. Dioscorides describes it as the produce of a Ferula growing in India, and we have no more recent information. It is the *sukbeenuj* of the Arabs, who give *sagafioon* as its Greek name. It reaches India from the Persian Gulf or the coasts of Arabia. It is difficult by price-currents and commercial reports to distinguish the routes which small articles of commerce pursue. It is imported into Europe from the Levant, and also from Alexandria. It is probably a product of Persia. Willdenow was of opinion that it was produced by *Ferula persica*, which Olivier thought produced Ammoniacum, and Dr. Hope that it yielded Assafœtida,—and which probably does yield some kind of fœtid Gum-Resin, as Michaux sent its seeds from Persia as those of Assafœtida. But it is preferable to leave this as a subject for investigation, than to stop inquiry by promulgating imperfect information.

Sagapenum is of a brownish-yellow or olive colour, chiefly in amygdaloidal masses, sometimes in tears: these are more or less transparent, soft, and of a waxy consistence. It has an alliaceous odour, and acrid taste, similar to, but less powerful than that of Assafœtida. Pelletier

found it to be composed chiefly of Resin and Gum, with about 11·8 per cent. of Volatile Oil; but Brandes found only 3·7 of the last.

Action. Uses. Antispasmodic, but considered less powerful than Assafœtida. Given in doses of gr. v.—℈j.

SAGAPENUM PRÆPARATUM, L. is made like *Prepared Ammoniacum*. *Off. Prep.* Pil. Galbani Comp. L.

ASSAFŒTIDA, L. E. D. Narthex Assafœtida, *Falconer.* (*Ferula*, Linn.) Gummi-resina e resectâ radice emissa, L. Gummy resinous exudation, E. D. Assafœtida.

Assafœtida, a product of Persia and Affghanistan, is mentioned in the ancient Sanscrit Amera Cosha. The ancients highly esteemed a gum-resin which the Romans called *Laser*, and the Greeks ὀπὸς Κυρηναϊκός, or the Cyrenaic Juice, from being produced in that region, The plant σίλφιον yielding it was an Umbellifer, and is represented on the coins of Cyrene. It has been discovered of late years, and named *Thapsia Silphium.* This Laser had become scarce even in the time of Pliny, who, as well as Dioscorides, describes another kind as obtained from Persia, India, and Armenia, which was probably the same that was known to the Hindoos. Avicenna describes *hulteet* as of two kinds: one, of good odour, from Chiruana (Cyrene ?), and the other fœtid, the present *Assa-fœtida.* The term *assa* is no doubt of oriental origin, since it is applied to other gum-resins. Thus Benzoin is called *hussee-looban;* and used to be called *Assa dulcis* in old works. Dr. Lindley has received the seeds of a Ferula called *hooshee. Anjedan*, the fruits or seeds (φύλλον of the Greeks), is usually translated *Laserpitium.* The plant is called *Angoozeh* by the Arabs. The root of *Silphion* is described by Arrian as affording food to herds of cattle on Paropamisus.

Assafœtida is produced in the dry southern provinces of Persia, as in the mountains of Fars and of Beloochistan, but chiefly in Khorassan and Affghanistan; likewise to the north of the Hindoo Khoosh range of mountains, where it was found by Burnes, and also in Wood's expedition to the Oxus. (*c.*) Dr. Falconer found it in Astore, introduced the plant into the Saharunpore Botanic Garden, as mentioned in the author's "Product. Resources of India," p. 223, and has obtained from it a small quantity of Assafœtida. He also sent home numerous seeds, which were distributed from the India House to several gardens; but the author has not heard whether any plants have been produced from them. But he has no doubt that some of those which he saw in 1849 growing vigorously in the Edinburgh Botanic Garden, and also in the Chelsea garden, were produced from these seeds, and not from those sent by Sir John M'Neill. The Assafœtida is conveyed on camels into India across both the Punjaub and Bhawulpore, and is sold in large quantities at the Hudwar Fair. It is also conveyed down the Indus and by the Persian Gulf to Bombay.

Two or three kinds of Fruit, called Seeds, are met with, which are said to be those of the Assafœtida plant; but there is no proof that more than one plant yields Assafœtida. Dr. Falconer, an excellent botanist, after examining the original specimens, considers the plant he saw in Astore to be the same as that figured by Kæmpfer; and Dr. G. Grant, who saw the plant at Syghan, says, as stated by Dr. Christison, that its roots, leaves, and flowering stem correspond on the whole with Kæmpfer's description, except that the root is deeply divided, like the outspread hand. The E. P. assigns *Ferula persica* as probably yielding some Assafœtida. There is no doubt that its seed has been sent from the north-west of Persia as that of the Assafœtida plant; but there is no proof, nor indeed is it probable, that it yields any of the Assafœtida of commerce. The gum-resins of these Umbelliferæ are too similar to each other, for any but experienced pharmacologists to determine between *inferior* Assafœtida and varieties of Sagapenum or other Gum-resins.

As Dr. Falconer, the author's friend and successor as Superintendent of the East India Company's Botanic Garden at Saharunpore, has had excellent opportunities for examining the Assafœtida plant, both in its native sites and as cultivated by himself, he has favoured the author with the following full account of this important species, which he has determined to belong to a genus allied to, but distinct from Ferula.

Narthex (Falc. MSS.)

Calycis margo obsoletus. *Petala* — ? *Stylopodium* plicato-urceolatum. *Styli* filiformes demum reflexi. *Fructus* a dorso plano-compressus margine dilatato cinctus. *Mericarpia* jugis primariis 5: 3 intermediis filiformibus, 2 lateralibus obsoletioribus, margini contiguis immersis. *Vittæ* in valleculis dorsalibus plerumque solitariæ (valleculis lateralibus nunc sesqui- vel bi-vittatis), commissurales 4—6 variæ inæquales, exterioribus sæpe reticulatim interruptis. *Semen* complanatum. *Carpophorum* bipartitum. *Umbellæ* pedunculatæ compositæ. *Involucrum* utrumque nullum. — Genus inter Peucedaneas, calycis margine edentato, fructus vittis magnis, commissuralibusque inæqualibus et involucro utroque nullo distinctum; Narthex nuncupatum, a vocabulo νάρθηξ apud Dioscoridem Ferulæ attributo.

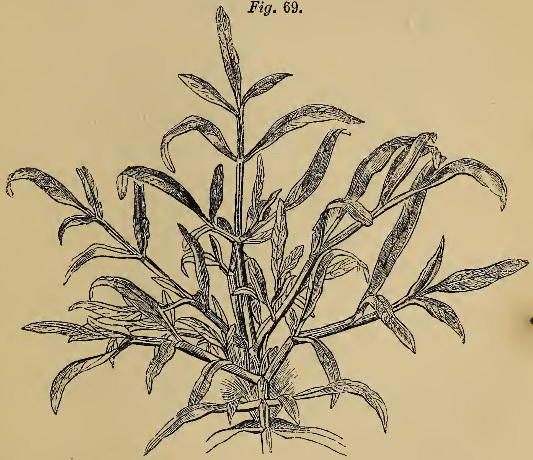
N. Assafœtida (Falc.) Caule tereti simplici, petiolis dilatatis aphyllis instructo, foliis radicalibus fasciculatis, petiolis trisectis, segmentis bipinnatisectis, laciniis lineari-lingulatis obtusis, inæqui-lateralibus integris vel variè sinuatis decurrentibus.—Assafœtida Disgunensis, Kæmpf. *Amœnit. Exot.* p. 535. Ferula Asafœtida. Linn. *Mater. Med.* p. 79. De Cand. *Prod.* iv. 173. Lindl. *Flor. Med.* p. 45. Fig. 69, 70, et 71.

Habit. in apricis inter saxa in valle "Astore" vel "Hussorah" dictâ prope Indum, ultra Cashmeer: indigenis Daradris "Sip" vel "Sup." Legi fructigerum prope Boosthon 21° die Septembris, 1838.

Descrip. A tall perennial plant, 5 to 8 feet high. *Root* fusiform, simple, or divided, a foot or upwards in length, about 3 inches in diameter at the top, with a dark greyish transversely corrugated surface: the summit invested above the soil with dark hair-like fibrous tegmenta, the persistent exuviæ of former years: cortical layer thick and tough, white or ash-coloured in the section, readily separable from the central core, and, like the latter, abounding in a white, milky, opaque, excessively fœtid, alliaceous juice. *Leaves* collected into a fascicle above the root, numerous, large, and spreading, about 18 inches in length in the adult

plant, of a light green colour above, paler underneath, and of a dry leathery texture: the petioles terete amplexicaul, and channeled at the base, trifurcated a little above it, the divisions united at an angle with each other, like the legs of a tripod, and bipinnately sected: the leaf-segments linear-ligulated, more or less obtuse, entire or sinuately lobed, variable in their offset, being either alternate or opposite, for the most part unequal-sided, and decurrent along the divisions of the petiole, forming a narrow winged channel upon the latter. *Midrib* prominent on the under side, veins slender and anastomosing by numerous reticulations. The leaves observed in a young growing plant (Fig 69) were about 9 inches in length, the leaf-segments being from 2 to 4 inches long by 4 to 6 lines in width. *Stem* erect, terete, simple, striated, about 2 inches in diameter at the base, solid throughout, the spongy medulla being traversed by scattered tough fibrous bundles of vessels, invested with alternate, vaginating, dilated, aphyllous petioles, and terminating in a luxuriant head of compound umbels. General as well as partial involucre entirely wanting. *Umbels* 10 to 20 rayed, immitted from the dilated spherical head of a common peduncle, the rays 2—4 inches in length. *Partial umbels* with very short rays aggregated into round capitula varying from 10 to 20 rays in the fertile, and from 25 to 30 in the barren umbellulæ. *Flowers* small; barren generally mixed up with the fertile flowers (?). Border of the *Calyx* obsolete, being reduced to very minute denticular points. (Petals in the barren flowers small oblique, unequal-sided, acute, without an elongated acumen?). *Stylopodia* urceolate and plicated, with a sinuous margin. *Styles* filiform, reflected in the ripe fruit, rather short and slender, attached by a broad base. *Fruit* from 7 to 15, ripening on the partial umbels, supported on short stalks. *Mericarps* varying from broad elliptical to elliptical obovate, 5—6 lines long by 3 to 4 lines broad, flat, thin foliaceous, but somewhat convex in the middle, with a dilated border, generally unequal-sided, of a dark reddish-brown

Fig. 69.



69. Narthex Assafœtida. *Falc.* Plant grown in H. E. India Company's Botanic Garden at Saharunpore.

towards the centre, lighter towards the margin, perfectly smooth, with somewhat of a glossy surface. Dorsal primary ridges 5: the 3 middle ridges filiform, slightly crested towards their confluence at the apex: the lateral ridges more obsolete, situated close to the margin, immersed in the substance of the border, but distinctly seen on the surface of commissure, and confluent with the middle nerve of the latter. The dilated border as wide as the space occupied by the 3 middle ridges. *Vittæ* in the dorsal furrows large and broad, occupying the entire width of the valleculæ, stretching from base to apex, usually solitary, but sometimes double in one or other of the middle furrows, and generally double or dichotomous, with a small branch in the broadest side of the margin, turgid with a fœtid juice: vittæ of the commissure varying from 4 to 6, very unequal and variable: one very slender vitta, which is frequently dichotomous in two fine threads confluent at the apex, being placed close on either side of the middle nerve; another of the size of the dorsal vittæ, situated more outwards, and a third at the inner side of the dilated border, over the edge of the seed, more slender, but frequently subdivided and interrupted so as to cover the border with a beautiful network of anastomosing ramifications. *Seed* flattened, with plain albumen. *Carpophores* bipartite, persistent, twice the length of the pedicels. *Flowers* white?

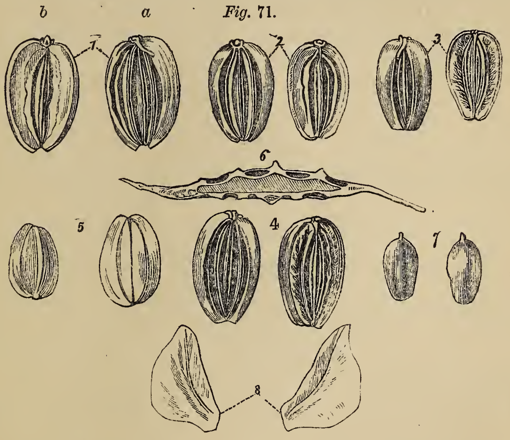
Fig. 70.

70. 9. Ovary. Style and Stylopodium enlarged. 10. Partial Umbel, with fertile flowers. 11. Umbel of barren flowers. 12. Partial Umbel in fruit with persistent Carpophores.

"The plant above described I believe to be true 'Assafœtida disgunensis,' or 'Hingiseh' of Kæmpfer. It does not appear to have been met with by any other botanist since it was examined *in situ* by that excellent and careful observer a century and a half ago.

I have compared my materials with Kæmpfer's description and figures (Amœn. Exot. p. 537), and with his original specimens contained in the Banksian collection in the British Museum, and found them, so far as a comparison could be instituted, to agree in every essential respect. The leaves "instar Pæoniæ ramosa" as represented in his figures, have the segments more obtuse and sinuated, and more alternate in their offset than they are represented in my drawing; but he describes them as being very variable in form, and some of the numerous leaf-specimens in his herbarium correspond with the figure which I have given. Kæmpfer mentions the umbellulæ as having only 5 or 6 rays, whereas I found them as numerous as 25 or 30 in the sterile capitula, and from 10 to 20 in the fertile ones. But he states that he never saw the plant in flower, and his description was probably drawn from the ripe state, in which the partial umbels occasionally present no more than 7 fruit-bearing stalks. There are two mericarps in his herbarium, of one of which I have given a representation (fig. 71. 5) agreeing exactly in form and in the development of the dorsal juga with those met with by me in the Astore plant: but Kæmpfer's specimens are glued down on paper, and they seem to have undergone some decay or alteration by which the vittæ have been emptied, so that their number and size cannot be distinctly made out. But they appear to be solitary in the dorsal valleculæ, and there is no indication of the numerous striæ represented in the figures of the fruit given in the Amœnitates, which may have confirmed authors in the belief that Kæmpfer's Assafœtida plant belonged to a species of Ferula. These mericarps are perfectly smooth, and exhibit nothing of the "quadatenus pilosum sive asperum," described in the Amœnitates, p. 538. Dr. Lindley, in his Flora Medica, p. 45, after an abridgment of Kæmpfer's description, states (it is not mentioned upon what evidence), the vittæ of the back to be "about 20 or 22, interrupted, anastomosing, and turgid with Assafœtida: of the commissure 10."

Fig. 71.



71. 1—4. Mericarps of the natural size. (*a.*) Dorsum. (*b.*) Commissure. 5. Mericarps in Kæmpfer's Herbarium, dorsal aspect. 6. Transverse section of Mericarp enlarged. 7. Seed, natural size. 8. Two Petals of a barren flower enlarged.

This account will apply to the fruit of a species of Ferula, but is entirely at variance with the characters presented by the fruits of the plants observed by Kæmpfer in Persia, and by myself in Astore.

Kæmpfer in his description says: "Folia sero autumno ex vertice progerminant, sex septem, et pro radicis magnitudine plura vel pauciora: quæ per brumam luxuriose vigent adultoque vere exarescunt." From the information which I gathered on the spot, confirmed by subsequent observation upon the growing plants introduced into the Botanic Garden at Saharunpore, the leaves of the Astore Assafœtida plant make their appearance in spring, and not in autumn, surviving through the winter, as stated by Kæmpfer respecting the Persian form. With these slight discrepancies, his description might serve for the Astore plant.

Narthex, both in the characters of the flowers and fruit, and in its "Pæony-leaved" habit, differs widely from any known species of Ferula, and appears to constitute a distinct and well-marked genus.

In the Dardoh or Dangree language (the Dardohs being the Daradi of Arrian) the plant is called "Sip" or "Sup." The young shoots of the stem in spring are prized as an excellent and delicate vegetable.

The species would appear to occur in the greatest abundance in the provinces of Khorassan and Laar in Persia, and thence to extend on the one hand into the plains of Toorkestan on the Oxus north of the Hindoo Khoosh mountains, where it seems to have been met with by Sir Alex. Burnes,* and on the other to stretch across from Beloochistan, through Candahar and other provinces of Affghanistan to the eastern side of the valley of the Indus, where it stops in Astore, and does not occur in great abundance. The whole of this region, which constitutes the head-quarters of the gum-bearing Umbelliferæ, possesses the common character of an excessively dry climate, indicated in Berghaus's hygrometric map in Johnson's Physical Atlas by a belt of white.

Besides the gum-resin, the fruit of *Narthex Assafœtida* is imported into India from Persia and Affghanistan, under the name of "Anjoodan," being extensively employed by the native physicians in India: "Anjoodan" being the epithet applied to the seed of the "Heengseh," or "Hulteet," by Avicenna, also quoted by Kæmpfer, and used by the Indo-Persian and Arabic writers generally in describing the Assafœtida plant. Another Umbelliferous fruit is also imported with it, and sold under the name of "Dooqoo" (a word evidently connected with the δαῦκος of the Greeks), being recommended as an excellent substitute for "Anjoodan," which it closely resembles in its general appearance. This I found to be the fruit of a species of true Ferula; it is one of the two Assafœtida-like fruits mentioned by Dr. Royle as occurring in the bazaars of northern India. The species of Ferula yielding this fruit may furnish some one of the obscurely-known gum-resins resembling Assafœtida produced in Persia.

I have examined another kind of Umbelliferous fruit in the collec-

* Burnes mentions the plant as an annual, probably in consequence of the annual decay of the stems. He states that sheep browse on the young shoots.

tion of Dr. Royle, labelled as "the seed of the wild Assafœtida plant collected and brought to England by Sir J. Macneil from Persia," which differs widely from the fruit both of Narthex and of Ferula, and belongs to another tribe of the order." H. F.

M. Buhse, a late traveller, states that the mode of collecting Assafœtida in Persia at the present day is exactly the same as that described by Kæmpfer 160 years ago. It is obtained by making incisions into or taking successive slices off the top of the root, and then collecting the produce, which is united in masses, and in this state is usually met with in commerce. It is at first rather soft, but becomes hard, of a yellowish or reddish-brown colour. When broken, an irregular, whitish, somewhat shining surface is displayed, which soon becomes red. The mass is composed of various-shaped pieces, some like tears pressed together, and in some parts agglutinated together by darker-coloured gum-resin. Some parts are cellular. By thus becoming red on exposure to the air, and its intolerable aliaceous odour, Assafœtida may be readily distinguished. The taste is garlicky, bitter, and acrid. It is best preserved covered by bladder. It is powdered with difficulty, even when become hard; softens by heat, and burns with a clear flame. Assafœtida is composed of Resin 65 parts, Volatile Oil 3·6, Gum 19·44, Bassorin 11·66, Salts 0·30. (*Pelletier.*) Brandes obtained less Resin, Volatile Oil 4·6, and 10·5 of various salts and impurities. The Oil is at first colourless, but becomes yellowish-brown, has an exceedingly offensive odour, a bitter and acrid taste, and contains some Sulphur. The formula has been determined by M. Hlasiwetz to be $C_{24}\,H_{22}\,S_3$, but on long exposure it becomes altered in composition. Water will dissolve the Gum, and form an emulsion with the other ingredients. Alcohol or Rectified Spirit is a good solvent, but an emulsion is formed when the solution is added to water. Ether dissolves the Oil and all the Resin, except about 2 per cent. of a peculiar kind. Ammonia also takes up the active ingredients.

Assafœtida Præparata, L. Prepared Assafœtida.

Prep. As *Ammoniacum præparatum.* By the process adopted the gum-resin is freed from the sand and other mechanical impurities with which it is occasionally contaminated, and reduced to a homogeneous consistence; but there is a danger at the same time of some of the volatile oil being dispelled by the heat employed.

Action. Uses. Stimulant, Antispasmodic; thought to be Emmenagogue and Anthelmintic. Much used as a condiment in the East. Useful in Spasmodic and Convulsive diseases, as Hysteria and Chorea, also in Hooping Cough, Flatulent Colic, and in Chronic Cough.

D. grs. v.—℈j. in pill or in some of its compounds every 3 or 4 hours. The Emulsion acts quickly, and may be formed readily by adding the Tincture to Aqua Pulegii.

ENEMA ASSAFŒTIDÆ, L. Enema Fœtidum, E. D. Enema of Assafœtida.

Prep. L. Rub *Prepared Assafœtida* ʒj. with *Decoction of Barley* Oß. added gradually, until they are perfectly mixed.
E. Mix *Tincture of Assafœtida* fʒij with *Warm water* f℥xij.
D. Add to the *Cathartic Enema* (p. 409) fʒij. of *Tinct. Assafœtidæ.*

TINCTURA ASSAFŒTIDÆ, L. E. D. Tincture of Assafœtida.

Prep. Macerate *Assafœtida* broken in small fragments ℥v. in *Rectified Spirit* Oij. for 7 days, and strain.

Action. Uses. Antispasmodic. Prescribed in Hysterical cases, &c. as Spir. Ammoniæ fœtidus (p. 67), in doses of fʒj.—fʒij.

PILULÆ ASSAFŒTIDÆ, E. Pil. Assafœtidæ Comp. D. Assafœtida pills.

Prep. E. Mix *Assafœtida, Galbanum,* and *Myrrh,* of each 3 parts, and *Conserve of Red Roses* 4 parts, or q. s. Beat into a proper pill mass.
D. *Assafœtida* ℥ij., *Galbanum, Myrrh,* and *Treacle* āā ℥j.

Action. Antispasmodic. *Dose* gr. v.—℈j.

EMPLASTRUM ASSAFŒTIDÆ, E. Assafœtida Plaster.

Prep. Melt together *Assafœtida* ℥ij., *Galbanum* ℥j. Strain them. Add melted *Litharge Plaster* ℥ij. and *Bees' Wax* ℥j. Mix thoroughly.

Action. Uses. Useful externally in the foregoing class of cases.

Off. Prep. Spir. Ammoniæ Fœtidus, L. E. D. Pilula Galbani Comp. L. (*Pil. Assafœtidæ,* E.) Pil. Aloes et Assafœtidæ, E.

AMMONIACUM, L. E. D. Dorema Ammoniacum, *Don.* Gummi-resina e caule et pediculo manans, aere indurata, L. Gummy-resinous exudation, E. D. Ammoniacum. Gum Ammoniac.

Ammoniacum is described by Dioscorides, 3, c. 88 (or 98) as the produce of a plant called *Agasyllis, Metopium* of Pliny, which grows in Cyrenaic Africa near the Temple of Jupiter Ammon, whence it derives its name. Mr. Don supposed this to be a corruption of Armoniacum : it is so written in some old books. Jackson in his account of Morocco states that the Ammoniacum plant, which he calls *Feshook,* grows in Morocco, near Al-Araish. The Hon. Fox Strangways favoured Dr. Lindley as well as the author with the fruit of a *Ferula* which was marked as that of *Fusogh,* or Gum Ammoniac, obtained by him from Tangier. Some of these were sent to Dr. Falconer, by whom they were grown in the Saharunpore Botanic Garden, and the plant found to be identical with *Ferula Tingitana.* Dr. Lindley had previously determined the fruit to be that of the same plant. In his Flora Medica he refers the *Feshook* of Jackson, t. 7, to *F. orientalis,* with a query. But the Ammoniacum of commerce of the present day is a product of Persia, and obtained from Bombay, having been previously imported there from the Persian Gulf, whence probably a portion is also carried up the Red Sea, and thus reaches Europe by the Levant.

Capt. Hart (Trans. Med. Soc. of Calcutta, i. p. 369) found the plant in the plains between Yezed-khast and Kumisha, on the road from Shiraz to Ispahan, or on the border of the provinces of Fars and of Irak Ajemi. Lt.-Col. Johnston saw the plants growing at Mayer and Yezde-Khast, and collected speciments of the plant with its fruit and gum. Lt.-Col. Wright obtained specimens at the same place, which he gave to the Linnean Society, and which Mr. Don described. M. Fontanier (Merat and De Lens, i. p. 25) also obtained it at Yezd-Cast in Faristan, which appears to be the same place. Major Willock informs the author that the *ooshak* plant is only to be met with in the province of Irak, in dry gravelly plains, where it is exposed to an ardent sun. Sir John M'Neil found it on the lows hills near Herat, and Dr. Grant at Syghan to the north of Bamean, where the same dry climate prevails. In the same kind of country, but more to the eastward, many other Umbelliferæ were found by Dr. Falconer, together with *Narthex Assafœtida* and *Prangos pabularia.*

A late traveller, M. Buhse, saw the Ammoniacum plant in Persia, growing near a village to the south of Damgam, and more than 3000 feet above the level of the sea. He states that it was called by the natives *weshach*, and he concluded it to be *Dorema Aucheri*, but he saw only the leaves, which were probably those of *D. Ammoniacum.* M. Fontanier says Gum Ammoniac exudes naturally at the axils of the umbel and upon the tumid apices of the peduncles. Wildenow concluded erroneously that Ammoniac was produced by *Heracleum gummiferum.*

Root large, perennial. Stems 7 to 9 feet high, about 4 inches in circumference at the base, clothed with glandular down (*Don*), smooth (*Fontanier*) glaucous, with the habit of Opopanax Chironium. Leaves large, petiolate, somewhat bipinnate, two feet long; pinnæ usually 3 pairs, each pair rather remote: lower leaflets distinct; superior ones confluent, deeply pinnatifid; segments oblong, mucronate, quite entire, or rarely a little lobed, coriaceous, veined beneath, 1—5 inches long, and ½ to 2 inches broad. Petiole ribbed, pubescent, much dilated, and sheathing at the base. Umbels proliferous, racemose, partial umbels globose, on short peduncles, usually disposed in a spicate manner. Neither general nor partial involucre. Peduncles terete, woolly. Flowers sessile, immersed in wool. (*Lindley.*) Margin of calyx 5-toothed, teeth acute membranous. Petals white, ovate, with an inflexed point. Disk large, fleshy, cup-shaped, with a plicate, rather lobulate margin. Stamens and styles yellow, the latter complanate, recurved at the apex. Stigmas truncate. Ovary densely woolly. Fruit elliptic, compressed from the back, surrounded by a broad flat edging. Mericarps with 3 distinct filiform ridges near the middle, and alternating with them 4 obtuse secondary ridges (two of the primary ridges confluent with the margins). Vittæ 1 to each secondary ridge, 1 to each primary marginal ridge, and 4 to the commissure, of which 2 (the exterior ones) are very small.—*Don and Lindley.**

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* The energetic traveller Aucher-Eloy visited the same localities, one of them Yezdikhast, and obtained fragments of a plant which has been named *Disernestum gummiferum* by Jaubert and Spach, in Illustr. Pl. Orient, who state that it is allied to Siler and to Agasyllis, and is hence placed in the tribe *Silerideæ.* v. Walper's Repert. ii. p. 939. It appears to the author to be only the above Dorema Ammoniacum described from imperfect specimens. Plant

As the plant abounds in juice, this readily exudes on the slightest puncture: M. Fontanier says, spontaneously. Capt. Hart states that when the plants have attained perfection, or about the middle of June, innumerable beetles pierce it in all directions. The juice soon becomes dry, and is picked off. The finest pieces being kept separate, form the *Ammoniacum in tears* of commerce, which vary in size, are yellowish externally, and of a white, opaline, or waxy appearance when fractured. These, when pressed together, form lump or Amygdaloid Ammoniacum, in which the tears appear agglutinated together by a softer material, often mixed with some of a darker colour. In the inferior kinds the tears are less abundant, and impurities, as sand, fruit of the plant, &c., are intermixed.

Ammoniac is rather hard, but readily softens by heat, has a powerful and peculiar smell, and bitter and acrid taste. Sp. Gr. 1·207. It consists, according to Bucholz, of 22·4 parts of Gum, 72 of Resin, 1·6 of Bassorin (Gluten ?), and 4 of Volatile Oil. Much less Oil has been obtained by other chemists, and by some none at all. Ammoniac forms an emulsion with water. Alcohol dissolves its Resin and Oil, but the tincture becomes milky on the addition of water.

AMMONIACUM PRÆPARATUM, L. Prepared Ammoniac.

Prep. Boil *Ammoniacum in lumps* ℔j. with *water* enough to cover it, until they are mixed; strain the mixture through a hair sieve; then evaporate in a water-bath, constantly stirring, until it solidifies on cooling.

Action. Uses. Stimulant Expectorant. Antispasmodic, chiefly in chronic Catarrhs.

D. gr. v.—gr. xx. Usually taken with Squill or in Emulsion.

MISTURA AMMONIACI, L. D. Ammoniac Mixture or Emulsion.

Prep. L. Rub up *prepared Ammoniacum* ʒv. with *Aq. Dest.* Oj. added gradually, till thoroughly mixed. D. Similar.

Action. Uses. Water dissolves the Gum, and thus suspends the Resin of the Ammoniac, when an Emulsion is formed. The addition of a little Vinegar assists in making it smoother. Stimulant Expectorant in chronic Catarrhs, &c., in doses of f℥ß. to f℥iß.

EMPLASTRUM AMMONIACI, L. E. D. Ammoniac Plaster.

Prep. L. Liquify *prepared Ammoniacum* ℥v. in *Dilute Acet. Acid* f℥viij.; then evaporate, constantly stirring, over a slow fire, to a proper consistence.
E. Similar.
D. Dissolve *Ammoniac in coarse powder* ℥iv. in *Proof Spirit* f℥iv. with the aid of heat. Strain and evaporate by a steam or water-bath.

Action. Uses. The Vinegar does not dissolve, but softens the Gum-

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of considerable height, finely hairy when young, but becomes smooth with age. The inferior leaves are very large, doubly compound. Partial umbels sessile or pedunculated on a leafless panicle, with the gum-resin collected especially in the axils of the partial umbels. Petals white. Disk cup-shaped, crenate, plicate. Fruit oval, compressed dorsally with narrow wings. Mericarps 6 or 9 ribbed ridges and vittæ delicate and fine.

resin, which may then be applied as a poultice, and forms an adhesive stimulant and resolvent plaster; often of use, when applied to indolent swellings. The spirit of the D. P. dissolves most of the Gum-resin, and is therefore likely to soften it more effectually.

Off. Prep. Pilulæ Scillæ Comp. L. E. D. Emplastrum Ammoniaci cum Hydrargyro, L. E. D. (*v.* p. 201.) Emp. Gummosum, et Saponis, E.

GALBANUM, L. E. D. Gummi Resina. Galbanum officinale, *Don* (?) L. Opoidea galbanifera, *Lindley*, D. An imperfectly ascertained plant, E. Galbanum.

Galbanum is supposed to be the same substance as the *Chelbenah* of Scripture (v. Cycl. of Biblical Lit.), as this word is very similar to the χαλβάνη of the Greeks, a substance known to Hippocrates, and described by Dioscorides, who gives μετώπιον as an additional name. Theophrastus had long previously stated that it was the produce of a *Panax*, Dioscorides of a *Ferula* of Syria. But the word *Syria* had a wide geographical signification in ancient times. Arabic and Persian authors seem to have been well acquainted with the plant, as they give *kinneh* and *nafeel* as its names, and *barzud* as that of the gum-resin. D'Herbelot states that this is the same as the *pirzed* of the Persians, who call the plant yielding it *giarkhust*. Whatever the plant may be, it is as yet unknown to botanists. Lobel attempted to ascertain it by sowing some of the seeds which he found attached to Galbanum, and obtained *Ferula Ferulago*, a native of North Africa and of Asia Minor, but which is not known to yield Galbanum; while *Bubon galbaniferum*, which is sometimes adduced, is a native of the Cape of Good Hope. The late Professor Don having found some seeds sticking to Galbanum, named the plant yielding them, though yet unknown, *Galbanum officinale*, belonging to the tribe *Silerinæ*, which is admitted (with a query) in the L. P. But these fruits may, or may not, be those of the Galbanum plant. Dr. Lindley has, in consequence, suggested another plant, of which he received the fruits from Sir John Macneil. This grows at Durrood, near Nishapore, in Khorassan, and yields a gum-resin of which a specimen seen by Dr. Pereira did not correspond with any known gum-resin. The author has several such in his collection. Dr. Lindley has named the plant, which is admitted into the D. P., *Opoidia galbanifera*, tribe Smyrneæ.

The most recent and perhaps the most credible information on this much contested point is derived from the personal inquiries made by M. Buhse in his Persian travels. He tells us that he found the plant from which Galbanum is prepared growing on the declivities of the Demawend mountains. He considers it all but identical with *Ferula erubescens*, but it differed from that plant in the absence of the commissural vittæ of the fruit. He is certain that it belongs neither to the genus *Galbanum* nor to *Opoidea*. The natives called the plant

Khassuch. (Some consider the Galbanum of Persia to be so distinct from that commonly obtained from the Levant, that it must be the product of a different plant.)

Galbanum is imported from India and the Levant, having probably been brought down the Persian Gulf. It is usually met with in masses of a brownish-yellow colour, more or less translucent and shining; sometimes in small tears, which are of a paler or even yellowish colour. In the former kind, the tears are reddish-yellow, often agglutinated together by a darker coloured substance, and mixed with pieces of the stalk, fruits, sand, &c. It is soft, can only be powdered in cold weather, has a bitter and even acrid taste, with a peculiar but not aliaceous odour. It consists of resin 65·8, Gum 22·6, Bassorin 1·8, Volatile Oil 3·3, with a trace of Malic acid, &c. Its properties depend chiefly upon the Oil, which may be separated, of a yellowish colour, by distilling with water. When Galbanum is distilled by itself at a temperature of 250° F. a bluish-coloured oil is obtained. Galbanum forms an emulsion with water, and is dissolved by proof Spirit.

GALBANUM PRÆPARATUM, L., is prepared in the same way as *Ammoniacum præp.*

Action. Uses. Antispasmodic; less powerful than Assafœtida; Expectorant.

D. gr. x.—℈j. in substance, or made into an emulsion.

PILULA GALBANI COMPOSITA, L. Compound Galbanum pill.

Prep. Take of *prepared Galbanum* ʒij., *Myrrh* and *prepared Sagapenum* āā ʒiij., *prepared Assafœtida* ʒj., *Soft Soap* ʒij., and *Treacle* q. s. Beat all together that a mass may be formed. *v.* PIL. ASSAFŒTIDÆ, E.

Action. Uses. Antispasmodic. Emmenagogue in doses of gr. x.—℈j.

EMPLASTRUM GALBANI, L. Emplastrum Gummosum, E. Galbanum plaster.

Prep. L. Melt together *prepared Galbanum* ℥viij. and *common Turpentine* ʒj.; then add *prepared Frankincense* ℥iij., and *Lead Plaster* ℔iij., first melted over a slow fire, and mix all together.

E. *Litharge Plaster* ℥iv., with *Ammoniac, Galbanum,* and *Bees' Wax* āā ℥ß.

Action. Uses. Stimulant and Discutient application to indolent tumours, &c.

Pharm. Prep. Emp. Assafœtidæ, E.

Tribe *Daucineæ.* Fruit dorsally sub-compressed or round. Carpels with 5 primary ridges, the lateral ones on the inner face; and 4 secondary ridges forming rows of prickles.

CAROTA, L. E. D. Daucus Carota, *Linn.* (*var.* sativa.) Radix recens; the fresh root. Root of the Cultivated Carrot.

The Carrot has long been cultivated in the East, where it is called

jugur and *gajur*. The Arabs give *istufleen* as its Greek name,—a corruption, no doubt, of the *σταφυλῖνος* of Dioscorides.

Stems 2 to 3 feet high, hispid. Leaves tripinnate; leaflets of the upper leaves linear, lanceolate, acute, of the lower leaves broader; leaflets of the general involucre pinnatifid, with linear segments, or the partial one linear, entire, or trifid. Calyx (fig. 68 *c.*) 5-toothed. Petals white, except in a central neutral flower, which is red, as mentioned by Dioscorides, obcordate (D.), with an inflexed lobe, exterior usually radiant and bifid. The umbels at first flat, become afterwards hollow, from the incurvature of the pedicels. Fruit dorsally (A.) compressed. Carpels with bristly primary (A. D.) ridges; secondary ridges winged, the wings divided often to the base into a row of simple prickles, which are equal in length to the diameter of the fruit.—Common on roadsides and in pastures throughout Europe and the Oriental Region.—Fig. 68, p. 455, a section of the flower and fruit from Adr. Juss. with the several references.—E. B. 1174.

The root of the cultivated Carrot is too well known from its fusiform shape, yellow colour, sweetish taste, and nutritious nature, to require description. It is officinal, on account of its succulent nature being favourable for making poultices, which are moderately stimulant.

The *wild variety* has fusiform roots, which are small, yellowish, and woody, with a bitter and acrid taste, but with the peculiar odour of the Carrot. The fruits, commonly called seeds, have this odour in a more marked degree, from their natural mode of growth being best suited for the development of the peculiar secretions of the plant. The Volatile Oil, which is secreted especially in the fruit, is diffused in less quantity over the whole plant, and even in the cultivated root. These fruits were, until lately, officinal in the L. and D. P.

Action. Uses. Demulcent. Used to make poultices.

Tribe *Cumineæ.* Fruit compressed laterally, ridges all apterous.

CYMINUM, L. E. Cuminum Cyminum, *Linn.* Fructus, the Fruit. Common Cumin.

Cumin (*kumoon* of the Arabs) is probably a native of Asia, and was made known to the Greeks from Egypt. It is extensively cultivated in the East, but has long been introduced into the south of Europe. England is chiefly supplied from Sicily and Malta.

Cumin is an annual, from 1 to 2 feet high, with much-divided leaves, having the segments long and setaceous. The umbels, both general and partial, from 3 — 5-rayed, with involucres of 2 — 4 simple or divided leaves. Involucels halved, of 2—4 leaves, finally reflexed, and exceeding in length the pubescent fruit. Flowers white or pink. Calyx with 5 lanceolate, setaceous, permanent teeth. Petals oblong, emarginate, with an inflexed point. Fruit contracted from the sides. Mericarps with wingless ribs, the 5 primary ones minutely muricated; 4 secondary ones prickly. Channels oblong, striated, minutely aculeate under the secondary ridges, with 1 vitta in each. Seed somewhat concave in front, and convex on the back.—Esenb. and Eberm. 288.

Cumin seeds, or rather fruits, are of a light-brown colour. The odour is aromatic, dependent on the Volatile Oil which is stored up in

the seed-coat. Taste warm, bitterish, and aromatic, but not so agreeable as anise. The albumen is insipid. 16 cwts. of the fruits yield about 44 lbs. of the Oil, which has a Sp. Gr. 0·945, pale yellow colour, and is limpid, of a disagreeable smell, and acrid taste.

Action. Uses. Stimulant Carminative. Condiment in India. Seldom used in medicine.

D. gr. xv.—ʒß.

EMPLASTRUM CUMINI, L. Cumin plaster.

Prep. Melt together *prepared Burgundy Pitch* ℔iij. and *Wax* ℥iij., then add *Olive Oil* and *water* āā f℥iß., with *Cumin, Caraway,* and *Bay-berries* āā ℥iij., first reduced to powder. Evaporate to a proper consistence.

Uses. Stimulant to indolent sores and tumours.

Tribe *Smyrneœ.* Fruit turgid, compressed laterally. Carpels with primary ridges only.

CONIUM, L. E. D. Conium maculatum, *Linn.* Herbæ agrestis Folium recens et exsiccatum, L. The leaves, E. D. Leaves of Hemlock.

There is little doubt of this being the κώνειον of the Greeks, and the *cicuta** of the Romans, as has long been supposed, and has been well argued by Dr. Pereira. The objection that it is not so clearly described as to be readily distinguished from other Umbelliferæ, would apply to accounts of many officinal plants, even in comparatively modern works. It is the *shokran* of the Arabs, who give *chuniun* and *kunion* as its Greek name, and give *bunj-roomee*, or Turkish *bunj*, as another name. The name *bunj* is applied to Henbane, while Datura is *bunj-dushtee*. It was re-introduced into practice by Störck.

Root biennial, fusiform, whitish, a little fleshy. Stems 3 to 5 feet high, erect, round, smooth, spotted with dull-coloured purple spots. Leaves large, shining, of a deep green colour, tripinnate, on long furrowed petioles, sheathing at the base. Leaflets lanceolate, pinnatifid, with the lower lobes incised, the others toothed. Umbels numerous, terminal, composed of many general as well as partial rays. General involucre of from 3 to 7 leaflets, ovate, cuspidate with membranous edges, partial involucre of 3 leaflets on one side ovate lanceolate, shorter than the umbels. Margin (*c*) of calyx obsolete. Petals 5 (*d*), white, obcordate with inflexed apices. Stamens (*d*) 5. Ovary ovate, 2-celled. Styles (*c*) 2, spreading. Fruit (*c*) ovate, compressed laterally. Carpels or half fruits with 5 prominent (*c, b*), equal, undulated, primary ridges, of which the lateral ones are marginal. No secondary ridges. The channels with many striæ but no vittæ.—Hedges and waste places throughout Europe; found in Greece by Sibthorp, in Cashmere by Falconer. Fl. in June and July. Fruit ripe in August and September. Fig. 72.—Esenb. and Eberm. 282; St. and Ch. 13.

This plant in its first year has a long slender root and a few radical leaves. In the second year it throws up its characteristic and spotted

* This must not, from the similarity of name, be confounded with *Cicuta maculata*. *Cicuta virosa* occurs in Cashmere, where it is called *Zehr-googul*, or poison-turnip. Persian, *Salep-e-Shaitan*, or Devil's Salep.

stem, on all parts smooth, but possessed of a strong and fœtid odour, compared to that of mice. It may be known by these characters, and by its unilateral partial involucres and the wavy crenated ridges of the fruit.* It is generally stated that the best time for collecting the leaves is when the plant is in full flower, or just before the forming of the fruit, as in other cases. This, Dr. Christison, who has paid great attention to the subject, doubts, as he has found that its poisonous properties are considerable in November and March of its first year. And the D. C. recommends that the leaves used to make the

Fig. 72.

72. *Conium maculatum.* *d.* Flower. *c.* Fruit. *b.* Transverse—and *a.* vertical section of fruit.

* This plant should be distinguished from Æthusa Cynapium, or Fool's Parsley, and also from *Anthriscus vulgaris* and *sylvaticus,* as well as *Myrrhis odorata* and *temulenta.* The other poisonous umbellifers are the above *Æthusa Cynapium,* Fool's Parsley; *Cicuta virosa,* Water Hemlock; *Œnanthe crocata,* Hemlock Water Dropwort; *Œnanthe apiifolia,* which is probably only a variety of *Œ. crocata.*

extract, should be gathered when the plant begins to flower. The fruit is more active than the leaves, and more so when green than when ripe and dry. The leaves especially should be carefully dried, in a dark airy room, at a temperature of about 120°, and preserved in well-closed, dark, and dry vessels. They should retain much of their natural deep-green colour, have a nauseous and somewhat acrid taste, with a peculiar mouse-like odour. This should be readily evolved when the plant is rubbed up with caustic Potash.

Several analyses have been made of Conium. Giseke in 1827 succeeded in concentrating its active principle with Sulphuric′. Geiger in 1831 detached it in the form of a volatile and oleaginous alkali, possessed of powerful poisonous properties. The experiments of Geiger have been confirmed by Dr. Christison. Both find that the distilled water, though having the peculiar odour of Hemlock owing to the presence of its Volatile Oil, is yet not poisonous; but that if the full-grown green fruits or leaves be distilled with water and caustic Potash, a strongly *alkaline* and poisonous *liquid* passes over, which is *Conia.* This has been found in the fruit and leaves, and exists in them as a salt, though its acid is unknown. It may be detached by presenting an acid, as the Sul′, which combines with the Conia; when this, by the action of Potash, may be separated from the acid, and distilled over with water at 212°. *Conia* is a colourless and transparent oily-looking body, lighter than water, having a powerful mouse-like odour, and a very acrid taste. It is strongly alkaline. Water takes up but little of it, but with a fourth of its weight it forms a Hydrate of Conia. Alcohol and Ether dissolve it readily; so do diluted acids, which combine with it. Its vapour produces white fumes with the vapour of H Cl, Hydrochlorate of Conia being formed. Exposed to the air, it becomes brownish; a resin and Ammonia are formed. It boils at 370°. Its formula is $C_{16} H_{15} N$. Like Ammonia, it contains no Oxygen. Subjected to a strong decomposing heat, an empyreumatic oil is yielded, which is very poisonous. It is most easily obtained by cautiously distilling over a Chloride of Calcium bath a mixture of strong solution of Potash with the alcoholic extract of the unripe fruit. (See Dr. Christison's able paper, Trans. Roy. Soc. Edin. 1836.)

Tests. Hemlock may be recognized by the characters which have been given of the plant and fruit, and the efficiency of the officinal products may be tested by triturating them with *Liq. Potassæ,* as directed in the E. P. By this it has been ascertained that some preparations contain no Conia, either from defective preparation, or from subsequent change. This accounts for some of the discrepant statements respecting the efficiency of Conium as a medicine.

Action. Uses. Narcotic Poison, having been supposed to excite convulsions and fatal coma. But from Dr. Christison's experiments, it seems that it exhausts the nervous energy of the spinal chord and voluntary muscles, occasioning merely convulsive tremors and slight

twitches, and eventually general paralysis of the muscles, and consequent stoppage of the breathing. Hemlock has long been employed as a Deobstruent and Alterative in glandular and visceral enlargements. Scirrhous, Cancerous, and Scrofulous diseases have been greatly relieved by it. (*v.* Bayle.) Useful also as an Antispasmodic in Hooping and other Coughs. It has been tried in Tetanus. As an Anodyne and Hypnotic, it allays pain and irritation, and promotes sleep. But Dr. Christison says that the whole subject requires to be investigated anew.

D. Of the *Powder*, fresh and well-dried, gr. iij. — gr. v. 2 or 3 times a day.

EXTRACTUM CONII, L. E. D. Extract of Hemlock.

Prep. L. Bruise fresh leaves of *Hemlock* ℔j. in a stone mortar; then press out the juice, and evaporate it, unstrained, to a proper consistence.

E. Beat Hemlock leaves into a unifrom pulp in a marble mortar, express the juice, and filter it. Evaporate to a very firm extract, either in a vacuum with the aid of heat, or spontaneously in shallow vessels, freed from dust by gauze screens, and exposed to a strong current of air.

D. Similar to L.; but the sediment which subsides from the juice on standing is first separated by filtration, and the albuminous green matter, which coagulates on the first application of heat, is skimmed off.

Thus the L. prep. is simply an inspissated juice; the E. prep. is the same, first filtered from the sediment; while the D. extract, being further freed from the inert albumen and chlorophyll, contains most of the active principle. This last prep. is nearly soluble in water.

Mr. Archer strongly recommends the plan pursued by the D. C. A heat of 212° will effect the coagulation completely. He advises that the extract be reduced to dryness by a continuous current of warm dry air. (P. J. x. 267.)

When the extract is triturated with *Liq. Potassæ*, a strong odour of Conia should be disengaged.

This extract, when well prepared, is of a fine deep-green colour, and may be kept good for some time. Evaporating the E. Tincture also forms an excellent extract. (*c.*)

D. gr. iij. 2 or 3 times a day, and gradually increased.

TINCTURA CONII, L. E. Tincture of Hemlock.

Prep. L. Macerate for 7 days dried leaves of *Conium* ℥v. in *Proof Spirit* Oij., then press and strain.

E. Fresh leaves of *Conium* ℥xij., *Tinct. of Cardamom* Oß., *Rectified Spirit* Oiß. Express the juice from the leaves, transmit Rectified Spirit through the residuum, mix the watery and spirituous fluids, and filter the product.

Action. Uses. Dr. Christison considers the Tincture obtained by the process of percolation the best of all preparations for medical use. Mr. Archer also considers Rectified Spirit to be the best solvent for Hemlock, as it abstracts the active principles, leaving behind the inert vegetable matters. The preparation made by Mr. Squire, by adding Rectified Spirit to the expressed juice, without extracting the residuum, is likewise good, and easily extemporized.

D. fʒß.—fʒj. of the L. P. ♏xv.—♏xxx. gradually increased, of the E. P.

PILULA CONII COMPOSITA, L. Compound Hemlock Pill.

Prep. Rub together into a mass *Extract of Hemlock* ʒv., powdered *Ipecacuanha* ʒj., and *Treacle* q. s.

Action. Uses. Anodyne Expectorant in spasmodic Coughs; in doses of gr. v.

UNGUENTUM CONII, L. Hemlock Ointment.

Prep. Take fresh leaves of *Conium* ℔j., and boil them in *Lard* ℔j. till crisp. Express through linen. Omitted from D. P., and introduced in L. P.

Action. Uses. As oil and fatty matters take up some of the active properties of Hemlock, this is an efficient application to foul or painful ulcers, &c.

CATAPLASMA CONII, L. Hemlock Poultice.

Prep. Add by degrees *powdered Linseed* ℥ivß. or q. s. to *Boiling water* f℥x., stirring constantly, so as to make a poultice. On this spread *Extract of Hemlock* ʒj., first softened in water.

Action. Uses. Soothing application to Cancerous and other sores.

Tribe *Coriandreœ.* Fruit contracted from the side, didymous or globular. Ridges apterous.

CORIANDRUM, L. E. D. Coriandrum sativum, *Linn.* Fructus; the Fruit or *seeds.* Coriander.

Coriander was the *gad* of the Hebrews, and was well known to the Greeks by the name *κόριον.* It has long been cultivated throughout the East, and is so now in Europe, as well as in this country.

Stems annual, from 1 to 2 feet high, round, striated, smooth. Leaves bipinnate, cut; leaflets of the lowermost wedge-shaped, of the others divided into linear segments. Calyx of 5 teeth. Petals white, often with a tinge of pink, obcordate, with an inflexed lobe, the exterior ones radiant and bifid. Fruit globose. Carpels with the primary ridges obsolete, the 4 secondary ones prominent, keeled. Interstices without vittæ. Commissure with 2 vittæ. Seed excavated in the front, covered with a loose membrane.—Occasionally found wild in this country, but must have escaped from cultivation.—St. and Ch. 94.

Coriander is much esteemed on account of its fruit (seeds as they are commonly called) both in the East, where it is much employed as a condiment, being an ingredient, for instance, of Currie Powder, and also in Europe, where it is required by confectioners and distillers. Coriander is well known by its globular form, and by its two carpels adhering firmly together, and forming a greyish-coloured fruit about the size of white pepper. It has a peculiar odour, and a warm aromatic taste, dependent on the presence of a yellowish-coloured volatile Oil, which necessarily possesses in a high degree the qualities of Coriander.

Action. Uses. Stimulant Carminative in doses of ℈ß.—ʒj. Chiefly employed as an adjunct.

Off. Prep. Conf. Sennæ, L. E. Inf. Sennæ Comp. E. Tinct. Sennæ Comp. E.

Many other plants of this order have been in use as diffusible stimulants in different parts of the world. Of these one may be mentioned here, which is more remarkable on account of the reputation which it suddenly acquired in this country a short time since, than for any notable medicinal virtues.

SUMBUL* (introduced into notice by Dr. Granville in his pamphlet —the *Sumbul*) is the name of a drug which is probably the produce of Central Asia, and has lately been imported in some quantities, partly from Bombay and partly from Russia. It is a root,—of what plant is not known, but it is supposed to be an Umbellifer: (Reinsch and Buchner). It is in yellowish-grey fragments, having very much the appearance of pieces of inferior Rhubarb. All specimens have a strong musky smell, apparently owing to a peculiar volatile oil. It is said to be employed in Persia as a protection against mephitic vapours. In England it has been recommended as a remedy in Asthma, Hysteria, and Epilepsy. The tincture is the form in which it has generally been given. It is possessed of antispasmodic and stimulant powers.

The ARALIACEÆ are closely allied to *Umbelliferæ;* but as they do not contain any officinal plants, a detailed notice of them here is not necessary. *Panax quinquefolium*, of which the root, called *Ginseng*, is so highly esteemed by the Chinese as to be considered a *panacea*, used to be sold for its weight in gold. It has a feeble odour, and a sweet, slightly aromatic taste, abounds in fecula, and can only be useful as a Nutrient and Demulcent. It is found in the northern parts of China, in Tauria, and in North America. A nearly allied species, *Panax Pseudo-Ginseng*, was found in the Himalayas by Dr. Wallich. *Aralia nudicaulis*, a native of North America, having roots which are slightly fragrant and of a sweetish aromatic taste, is sometimes called *False*, and used as a substitute for true *Sarsaparilla*. *A. spinosa*, called *Angelica* or *Toothache-tree* in North America, is a stimulant Diaphoretic.

The CORNACEÆ include plants that abound in bitter and astringent principles, but none are officinal in the British Pharmacopœias. According to Landerer, the fruit of *Cornus mascula* is in frequent use as a styptic among the Turks, being also employed by them in diarrhœa and cholera, and used in the manufacture of sherbet. The fruits of *C. officinalis* enter into the composition of popular fever-drinks in

* The word *Sumbul* or *Sunbul*, written also *Senbul*, is used as a generic term in Persian and Arabic works on Materia Medica. See *Spica*, that is, *Nardum;* in the Latin translation of Avicenna; and *Senbel*, No. 1042, 1048, and 9, in F. Gladwin's *Ulfaz Udwieh.* The Author obtained in India, under the name of *Sumbul-al-teeb*, or fragrant Sumbul, the root-stocks of *Nardostachys Jatamansi* as the *Nardos* or Spikenard of the ancients. *Sumbul roomee*, was said to be *narden uklutee;* this is thought to be *Valeriana celtica*, and *Sumbul jibullee*, or mountain nard, supposed to be *Valeriana tuberosa*. A *Sumbul-i-farsee*, or *Persian sumbul*, is supposed by some to refer to *Adiantum Capillus Veneris*, but it has the description of Hyacinthos by Dioscorides applied to it, but *Polyanthes tuberosa* is substituted for it in India. A *Sunbul-i-khatai*, or Cathayan Sumbul, is also mentioned. This may be the Sumbul lately introduced into this country.

Japan. And the inspissated juice of the green bark of *C. circinata*, or the round-leaved Cornel, has enjoyed a high reputation as an astringent tonic in the United States of America, having even been substituted for Cinchona in the treatment of intermittents.

The CRASSULACEÆ are generally distinguished by the acrid nature of their juices, some of the order being also astringent. The *Cotyledon umbilicus*, Linn., grows abundantly on rocks and old walls in the West of England. It has long been in use as a popular remedy for hysteria, as well as for the purpose of destroying corns and warts. Of late years its use has been revived by Mr. Salter of Poole, and it has been highly spoken of by him and by other practitioners as a remedy for Epilepsy. The expressed and inspissated juice of the whole plant, but particularly of the succulent leaves, is given for some time in doses of ℨß. or more. Dr. Pappe (*Flor. Cap. Med. Prod.*) makes mention of the *C. orbiculata*, of Cape Town, as a known and tried remedy for the same disorder. It also is used by the Boers and settlers as an external application for the same purposes as the other in England.

Sub-class III. COROLLIFLORÆ.

CAPRIFOLIACEÆ, *Juss.*

The Caprifoliaceæ are found in temperate and cold parts of the world, and are not possessed of very active properties.

SAMBUCUS, L. E. Sambucus nigra, *Linn.* Flos recens, L. Flowers, E. *Pentand. Trigyn.* Linn. Common Elder.

The Elder, indigenous in Europe, was known to the Greeks, and called ἀκτή by Dioscorides.

Arborescent; much, but always oppositely branched; young branches filled with spongy pith. Leaves pinnate; leaflets usually 2 pairs with an odd one, ovate, serrate, cuspidate. Cymes large, terminal, with 5 principal branches. Calyx limb 5-cleft. Corolla cream-coloured, rotate, 5-lobed, finally reflexed, with a faint smell. Stamens 5. Stigmas 3, sessile. Berry globular, black, 3—4-seeded.—St. and Ch. ii. 79.

Though many parts of the Elder have been officinal at different times,* few are possessed of any active properties. A little of the Volatile Oil, upon which the odour of the flowers depends, may be separated by distillation; but Dr. Pereira has shown that the once officinal Oil of Elder is a spurious preparation made by boiling Elder leaves in Rape Oil. But the flowers are sweet-scented, and contain a volatile oil. The inner bark of the Elder-tree has been used as a Cathartic.

* In a curious old book, *Anatomia Sambuci*, published in England about the middle of the 17th century, the different parts of this tree were extolled as unfailing specifics for nearly all the ills that afflict mankind.

Aqua Sambuci, L. E. Elder Flower Water.

Prep. L. Mix *Elder Flowers* ℔x. with *Aq.* Cij. and distil Cj. E. Similar: *Rect. Spirit* f℥iij. are added before the distillation.

Action. Uses. Used as a vehicle, and for flavouring medicines.

Unguentum Sambuci, L. Elder Ointment.

Prep. Boil *Elder Flowers* ℔j. in *Lard* ℔j. till they become crisp. Press through linen.

Action. Uses. Mild cooling Ointment.

Cinchonaceæ, *Lindley*.

This order formed part of the Rubiaceæ of Jussieu, which has been separated into Galiaceæ (or Stellatæ) and Cinchonaceæ.

Galiaceæ have whorled leaves; Cinchonaceæ have opposite leaves with interpetiolar stipules. They are found in the tropical parts of the world. Some secrete bitter and astringent principles, as Quina, Cinchonia, Tannin, and are used as febrifuges; others again form Emetina, and are used as Emetics. They occur in tropical parts of the world, and on the Andes of Peru, and mountains of India, as high as the belt of tropical vegetation.

Ipecacuanha, L. E. D. Cephaëlis Ipecacuanha, *Tussac.* Radix, L. Root, E. D. Ipecacuan. Ipecacuanha.

Ipecacuanha, a name adopted from the language of the South Americans (by whom it is also called *Praya de Mato*), has been applied to a variety of Emetic roots, but is restricted in the Pharmacopœias to the roots of the above Cephaëlis. This was first distinctly noticed in the Nat. Hist. of Brazil of Piso, and Marcgraaf, p. 101, and p. 17, (1648), as a *brown*-coloured Ipecacuan, and distinguished from another of a *white* colour, with the plant something like Pulegium. It was first brought into notice in Europe by Helvetius, about 1686. The plant yielding it was long unknown. Dr. Gomez was the first (Memoria sobre ipecacuanha fusca du Bresil, 1801) to describe and figure the genuine plant; but having left specimens with Brotero of Coimbra, and he with Tussac of Nantes, the former, without the permission of or acknowledgment to Gomez, described it in the Linnæan Trans. vi. p. 137, t. 11, 1802, as a species of Callicocca. But this genus is identical with the Cephaelis of Swartz, to which it was referred by Tussac and published in the Journ. de Bot. of M. Desvaux, iv. p. 204 (1813). The subject has since been investigated by Merat, Richard, Martius, and A. St. Hilaire. Merat, Guibourt, and others distinguish it into three varieties, *Brown*, *Red*, and *Grey Ipecacuan*, depending on the colour of the epidermis.

Cephaëlis Ipecacuanha (fig. 73) has a perennial root, simple, flexuose, or with a few diverging branches, a few inches in length, about the thickness of a quill, knotty, with transverse rings; when fresh, of a pale brown colour externally. Stem suffruticose, ascending, often rooting near the ground, at length erect,

somewhat pubescent towards the apex. Leaves from 4 to 6 or 8 on a stem, opposite, oblong, obovate, acute, roughish above, finely pubescent beneath. Stipules erect, 4—6 cleft. Peduncles solitary, axillary, downy, erect when in flower, drooping when in fruit. Flowers collected into heads, and inclosed by a large 1-leafed involucre, which is deeply 4 to 6 cleft. Segments obovate. Bracts one to each flower, obovate, oblong. Calyx minute, with 5 blunt short teeth. Corolla white, funnel-shaped; tube downy on the outside and at the orifice; limb with 5 ovate reflexed segments. Stamens 5, with filiform filaments and linear anthers, which project a little beyond the corolla. Ovary surmounted by a fleshy disk. Stigma bifid. Berry about the size of a coffee-bean, of a dark violet-colour, crowned by the remains of the calyx, 2-celled, 2-seeded, with a longitudinal fleshy dissepiment. Nucleus plano-convex, furrowed on the flat side. Flowers from November to March, and ripens fruit in May.—A native of shady places in the forests of Brazil from the province of Rio Janeiro to that of Pernambuco. Found also in forests near Villa Mena by Weddell.—Fig. *v.* Gomes 1. c. 1. 2. Linn. Trans. vi. t. 11. Martius Spec. Mat. Med. Bras. 4. t. 1. St. Hilaire. Pl. Us. de Brazil. pl. 6. Nees and Eberm. 258. St. and Ch. 62.

Fig. 73.

This plant yields the Brown or Grey, *annulated*, or true, sometimes called Brazilian or Lisbon Ipecacuanha, which is in general the only sort met with in this country. It is collected at all seasons of the year, but chiefly from January to March, and is imported from Rio Janeiro, Bahia, and Pernambuco.*

* Dr. Weddell states that the plant is usually called *Poaya* in Brazil. It grows extensively in that country, but the present exportation takes place

The roots of *annulated* Ipecacuanha, as met with in commerce, are of a greyish or light-brown colour,—have sometimes attached to their upper part a straight cylindrical part, by which it was connected with the stem,—are 2 or 3 inches in length, simple or branched, variously contorted, about the thickness of a small quill,—and are composed apparently of a series of transverse but unequal rings, separated by nearly parallel grooves, giving the whole a knotted appearance. The rings consist of an external *cortical* portion, which is horny but brittle, and are apparently strung upon a slender, tough, and whitish ligneous portion, which is called *meditullium*, forming about $\frac{1}{5}$ of good Ipecacuan. This part has little odour or taste, and is comparatively inert. The cortical portion has a peculiar nauseous odour, and a slightly bitter, somewhat acrid taste. This is said to be more evident in the fresh plant, and the odour is extremely disagreeable to many when the root is powdered. The active properties are taken up by water, Alcohol, Proof Spirit, or Wine. Pelletier analyzed Ipecacuanha root, and found in the cortical portion a peculiar principle which he called *Emetina*, but which is rather *Emetic Extract*, 16 parts, odoriferous Fatty matter 2 (this consists of an odorous volatile oil, and of a scentless fixed fatty matter), Wax 6, Gum 10, Starch 42, Lignine 20 parts, loss 4 parts=100. The Red variety contained only 14 per cent. of *Emetic extract*. The Meditullium contains only about 1 per cent. of Emetic Extract, and about 67 per cent. of Ligneous fibre.

The Emetic Extract, or *Matière Vomitive* as it was first called, was afterwards shown to be impure, and good Ipecacuanha found to contain only about 1 per cent. of pure *Emetina*. This is colourless, uncrystallizable, alkaline in its properties, without odour, and nearly without taste; fusible at about 120°, sparingly soluble in water, but very much so in Alcohol or proof Spirit. It forms bitter salts with acids, and is precipitated when in solution by Tincture of Galls. Sesquichloride of Iron imparts a greenish colour to the decoction of Ipecacuanha. Emetina is composed of $C_{35}\,H_{25}\,O_9\,N$. Impure Emetina, which is that most frequently met with, is of a yellowish-white colour.

Besides this important constituent, Willick has found in Ipecacuanha root a new acid, which may be called *Cephaëlic acid*, and bears some analogy to Gallic'. The formula calculated for it is $C_{14}\,H_8\,O_6+HO$. It is soluble in Alcohol and in Water, less so in Ether. It produces the above mentioned green colour with a solution of Sesquichlor. Iron. With Ammonia it strikes a violet, and with excess of the same alkali a deep black.

chiefly from the province of Matto-Grosso. The shrubs are found growing under the shade of large trees in the tropical forests situated in the basin of the Rio Paraguay and its tributaries, not in localities subject to the inundation of rivers, but on elevated spots, rooting in a moist sand impregnated with vegetable remains. In such places the *Cephaëlis* is found in clumps, called *Redoleros* by the gatherers.

A kind of *Ipecacuanha*, known as *striated* and also as *Black* or *Peruvian Ipecacuan*, is yielded by a different plant of this family, with much larger joints, the *Psychotria emetica*, of the tribe Coffeæ, a native of New Granada, which indeed was at one time supposed to yield the true kind. Pelletier found that it contained about 9 per cent. of his impure Emetina.

A third kind of Ipecacuanha, and that referred to by Piso, is the white kind, distinguished by its *white* colour, *amylaceous* nature, and *undulated* appearance. This is yielded by *Richardsonia scabra* (*R. braziliensis* of other authors), a plant of the tribe *Spermacoceæ* of this family, a native of Brazil, New Granada, Vera Cruz, &c. *R. rosea* yields a similar product. This kind contains only about 6 per cent. of impure Emetina.

Several other Rubiaceous plants are emetic in nature, and some of other families, as some species of *Polygaleæ*, of *Asclepiadeæ*, and of *Euphorbiaceæ*;—and of *Violaceæ*, *Ionidium Ipecacuanha*. *I. parviflorum* yields the Cuichuncully de Cuença, for specimens of which I am indebted to the Hon. Fox Strangways.

Action. Uses. Irritant, Nauseant Emetic, Expectorant, Diaphoretic, Sedative. Useful as an Expectorant and Diaphoretic in Catarrh, as a Diaphoretic in febrile affections of various kinds, or to cause a determination to the skin in Diarrhœa and Dysentery. Emetic to cut short the accession of an ague, &c., evacuate the stomach, or give a shock to the system. Nauseant Sedative in Hæmorrhage, &c.

D. gr. xv.—℈j. or even ʒß. of the powder as an Emetic; often conjoined with Tartar Emetic gr. j., assisting its action with warm water or Chamomile Tea. gr. ij. as a Nauseant. gr. j.—gr. ij. as an Expectorant and Diaphoretic. gr. $\frac{1}{2}$ as an Alterative in Dyspepsia, or of Emetina gr. $\frac{1}{16}$.

VINUM IPECACUANHÆ, L. E. D. Ipecacuanha Wine.

Prep. L. Macerate *Ipecacuanha root bruised* ℥ijß. in *Sherry Wine* Oij. for 7 days, and filter. E. D. Similar.

Action. Uses. Expectorant and Diaphoretic in doses of ♏x. to ♏xxx. Emetic in doses of fʒij. to fʒiv. Often given to children in doses of ♏xx. to fʒj.

SYRUPUS IPECACUANHÆ, E. Syrup of Ipecacuanha.

Prep. Take of *Ipecacuan* in coarse powder ℥iv., *Rectified Spirit* Oj., *Proof Spirit* and *Aq. dest.* āā f℥xiv., *Syrup* Ovij. Digest the *Ipecacuan* in *Rect. Sp.* f℥xv. at a gentle heat for 24 hours; strain, squeeze the residue, and filter. Repeat this process with the residue and Proof Spirit, and again with the water. Unite the fluids, and distil off the Spirit, till the residuum amount to f℥xij. Add to the residuum *Rect. Sp.* f℥v. and then the Syrup. Dr. Christison says this process is unnecessarily complex, and that a Syrup made from the Alcoholic Extract, as directed in the Parisian Codex, is probably as good.

Action. Uses. Expectorant fʒj.—fʒij. Emetic for infants fʒß.—fʒj.

Pulvis Ipecacuanhæ Compositus, L. E. D. Compound Ipecacuan, or Dover's, Powder.

Prep. L. Triturate thoroughly together *Ipecacuan* in powder and *Opium* āā ʒj., *Sulphate of Potash* ʒviij. E. D. Same strength.

Action. Uses. 1 gr. in 10 of Opium. Diaphoretic in doses of gr. v.—gr. x., sometimes repeated at short intervals. One of the most valuable Sudorifics; the Opium apparently causing a determination to the skin, and the Ipecacuan its relaxation. Dr. Dover directed his powder to be given in a glass of white wine posset, covering up warm, and drinking about a quart of the posset while sweating. It is often necessary to avoid drinking too soon, to prevent vomiting.

Pilula Ipecacuanhæ cum Scilla, L. Pill of Ipecacuanha and Squill.

Prep. Take of *Pulv. Ipecac. Co.* ʒiij., *Squill freshly powdered* and *Ammoniacum powdered* āā ʒj., *Treacle* q. s. Beat all together that a mass may be formed.

Action. Uses. Diaphoretic and Expectorant.
D. gr. v.—gr. x.

Pilulæ Ipecacuanhæ et Opii, E. Compound Ipecacuan Pills.

Prep. Take of *Comp. Ipecac. powder* ʒiij., *Conserve of Red Roses* ʒj., beat into a proper mass, and divide into gr. iv. pills.

Action. Uses. Diaphoretic, in doses of gr. v.—gr. x.
Ipecacuanha and Emetine are both sometimes introduced into the system by friction, in the form of liniment or ointment.
Pharm. Prep. Trochisci Morphiæ et Ipecacuanhæ (p. 310).

Coffea arabica, *quhwa* of the Arabs (of the tribe and sub-tribe *Coffeæ*) is a native of Arabia Felix and of the borders of Abyssinia. From the former it has been introduced into, and is cultivated in various countries. It is too well known as an article of diet to require detailed notice here, and is remarkable for *Caffeine* having been found to be identical with *Theine* (*v.* p. 340) and for its stimulant or rousing influence on the brain, especially in those unaccustomed to its use. Hence it is employed as a Cerebral Stimulant and Antisoporific, and to counteract the effects of Opium and other Narcotic poisons. An infusion of the roasted leaves is drunk in Sumatra.

Cinchona, L. E. D. Pale, Yellow, and Red Barks, produced by different species of Cinchona, some of which are yet unascertained.

Cinchona was so named by Linnæus in compliment to the Countess of Chincon, lady of the then Viceroy of Peru, who was cured by, and who brought from thence to Europe in 1639, some of this not more celebrated than invaluable bark. The native names *quinquino* and

quina-quina are, however, very similar to the scientific one. It is also called *cascarilla* in South America. The history of the discovery of Peruvian bark is obscure. The natives are supposed to have been unacquainted with its virtues, but the Indians of Malacatos knew them in 1739, and others before 1696. Its medicinal use was thought to have been discovered by the Jesuits, who chiefly made the bark known at an early period in Europe. The plant or plants yielding the bark were long entirely and are still in some measure unknown. The first published notice seems to be that of Dr. Arrot in the Philosophical Transactions for 1737. In that year also La Condamine visited Loxa, and sent a memoir, Sur le Quinquina, in the following year to the *Acad. Royale des Sciences.* He obtained specimens of the best kind of bark, the *Cascarilla fina de Loxa*, and the species which he figured has been since named *Cinchona Condaminea.* Joseph de Jussieu visited the province of Loxa in 1739, also upper Peru, and penetrated almost to the frontiers of Brazil. His many descriptions have remained unnoticed until very recently. About the year 1772 Mutis sent a few specimens to Linnæus from the mountains of New Granada, and with his pupil, Zea, promulgated some inaccurate information about what they conceived to be the officinal barks of Peru. As at first only a single kind of bark (that of Loxa) was known, but followed in 1775 by some sent by Mutis, and then by a great variety distinguished by various commercial names, so one species of Cinchona, named *C. officinalis*, was supposed to yield the officinal bark. The specimens, however, from which this species was named having been discovered to belong to different plants, the name is not now recognized; but in its place we have several well-known and excellently figured species of Cinchona, which are carefully distinguished from those which belong to allied genera. The Spanish Government, in addition to the employment of Mutis, instituted another expedition for the investigation of the Cinchona forests and vegetation of Peru. This Ruiz and Pavon commenced in the year 1777, and at their departure they were assisted by Taffala and Manzanilla. From 1798 to 1802 they published much valuable information respecting, and gave accurate figures of, several species of Cinchona in their *Flora Peruviana*, and *Quinologia* with its *Supplemento.*

The celebrated Humboldt with Bonpland visited the same regions and in the *Plantæ Æquinoctiales* figured and described some of the species. Pöppig investigated, and has given valuable information respecting, the species and barks of the districts of Huanuco and Cuchero in his *Reise in Chili, Peru, &c.* Dr. Weddell, during the years 1846 and 1847, carefully investigated the Cinchona regions of Bolivia and of a part of Peru, between 19° and 13° of south latitude, where he discovered the species (*C. Calisaya*) yielding the *yellow* bark of English commerce. He has published the results of his investigations in a magnificent folio entitled *Histoire Naturelle des Quinquinas*, Paris, 1849, which may serve as a model for such monographs.

The species of Cinchona made known by the travellers and botanists previous to Weddell were elucidated by Mr. Lambert, in his works on the genus Cinchona, and by De Candolle in his Prodromus; but most fully by Dr. Lindley in his *Flora Medica*, he having, as materials to work upon, the above mentioned publications,—a very extensive series of dried specimens belonging to the late Dr. A. T. Thomson, which had been taken out of a Spanish prize, having been collected by Mutis in 1805, near Loxa and Santa Zé de Bagota,—also the valuable collection of Lambert (now in the British Museum) which contained a nearly complete set of the species which had been described in the *Flora Peruviana*. From these various sources 24 species of Cinchona were described in botanical works. These, Dr. Weddell having seen many of them growing in different situations, has reduced to 11, but has been able to add 8 new ones. The whole number of species of Cinchona is now 19. His distribution "appears entirely conformable to nature, since the chemical composition supports the botanical characters, for the true species of Cinchona alone afford Quinine and Cinchonine, while astringent principles alone are found in the genus Cascarilla." *Rapport à l'Acad.*

Many species formerly described as true species of Cinchona, have now been referred to the genus Cascarilla, which is an unfortunate name, as it leads to ambiguity; other species have been referred by other botanists as well as by Weddell to other allied genera; as Exostemma, Remijia, Buena, Pincneya, Danais, Lasionema, Ladenbergia, Cosmibuena, Luculia, Hymenodictyon.

The genus Cinchona (fig. 74 and 75) is distinguished by having the calyx turbinate, united with the ovary, 5-toothed. Corolla hypocrateriform, with a roundish tube, limb 5-fid, laciniæ lanceolate, hairy at the margin, and, like the tube, pubescent on the outside, valvate in æstivation. Stamens 5 alternate, filaments inserted into the lower part of the tube of the corol; anthers included or protruding beyond the tube of the corol. Ovary, with a fleshy, cushion-like disk. Ovules numerous, imbricated, anatropous. Style simple. Stigma, either concealed within or protruding beyond the corol. Capsule ovate, oblong, or linear lanceolate, furrowed on two sides, crowned with the limb of the calyx, smooth or pubescent, 2-celled, many seeded, valves separating from the base to the apex. Seeds numerous, peltately affixed to the placentæ, imbricated, compressed, with an oblong nucleus, surrounded by a membranous denticulate wing. Embryo straight in the margin of a fleshy albumen, cotyledons ovate entire, radicle round inferior.—The species form evergreen trees or shrubs. Stems and branches round. The cellular parts contain most Cinchonine and the fibrous Quinine. Periderm various, sometimes thin, at other times thick. Wood whitish, becoming at length yellowish, with false medullary rays,—Weddell. Leaves opposite, petiolate, smooth, pubescent or tomentose, with peculiar reflection from the surface in consequence of the structure of the cellular tissue. Stipules interpetiolar, often free and deciduous, or slightly connate at the base, with numerous minute glands on the inside, which secrete gum-resinous matter at the base. Flowers cymoso-paniculate, white, oftener flesh-coloured or purple, very fragrant, panicles terminal, branchlets and pedicels bracteate at the base.

The true Cinchonas are confined exclusively to the Andes, and chiefly on the eastern face of the Cordilleras, where occurs the zone of forests, from about 4000 to near 12,000 feet of elevation above the

sea. In some places they occur also on the western face where this is covered by forests. The Cinchonas themselves seldom form an entire forest, but rather groups (called *manchas*). Frequently they grow separately, sometimes in exposed situations, where even the arboreous species do not grow beyond the size of shrubs. The characteristics of this forest are of a tropical nature. Palms seem to be found throughout, and in many parts form the principal feature. Along with these there are Tree Ferns, gigantic Climbers, Bamboos, Plantains, Aroideæ, Cecropias, Melastomaceæ, an Oak, a Myrica, and other genera are also found as in the lower and southern Himalayas, as well as on the Nielgherries. There would appear to be always great moisture, with probably a mean temperature of about 62°.

The Cinchona region forms a great but comparatively narrow arc of a circle which has its convexity towards the west, and of which the most western part is near its middle or about Loxa, where it approaches the sea. The northern extremity of the arc reaches nearly to Carracas about 10° of N. lat., while the southern extremity reaches to near Santa Cruz de la Sierra in Bolivia, about 19° S. lat., near where Dr. Weddell discovered the species called Cinchona Australis. *C. Ronaima* of Guiana has been removed to the genus Cascarilla, as also *C. magnifolia*, supposed at one time to be the species which yielded Red Bark. It is found generally at the bottom of valleys, whilst the true Cinchonas are found in more elevated parts.

A region of forests previously unexplored is first examined by *practicos* or experienced *cascarilleros*, that is, Indian bark collectors. A *major domo* is then sent into the forest, who receives and examines the bark as it is brought in by the cascarilleros, having previously distributed provisions to them. The bark is peeled about the month of May, or at any time excepting during the rainy season. It is either cut from the trees as they stand, or the trees are felled a little above their roots. This is the preferable method, as suckers shoot up from the roots and soon yield profitable bark. The periderm is removed by striking the trunk with a mallet. The bark is sometimes cleaned with a brush and then taken off by uniform incisions in pieces about 15 to 18 inches long and 4 or 5 inches wide. The thinnest pieces of bark from the branches or small trunks are simply exposed to the sun's rays, and soon assume the form of hollow cylinders, or that of the quilled cinchona. The bark from the large trunk, which is to constitute the flat (*tabla* or *plancha*) cinchona, undergoes a certain degree of pressure during the process of drying. The major domo rejects the bad specimens of bark and sews the remainder up in coarse canvas. When it reaches the depots in towns an outer envelope of a fresh hide forms the packages, known by the name of *serons*, and which usually contain only one kind of bark. The mode of cutting down the trees or stripping them of their bark is most wasteful, and as no means are adopted of repairing this continued destruction, the probable result will be with the more distant as has already occurred with

the nearer forests, that a partial or even entire disappearance may take place of the more valuable kinds of Cinchona.

The genus Cinchona, as at present constituted, includes all the species which yield barks suitable for medicinal use. The genus Cascarilla and others yield spurious barks, which are sometimes introduced into commerce mixed with the genuine barks. The characters of all, therefore, require to be studied. Though many species of Cinchona are known, and likewise a great variety of barks, there has always been considerable difficulty in determining which of the latter are produced by the known species of the former. M. Pavon sent Mr. Lambert forty-four sorts of Peruvian barks with their names; but these were made little use of until recently. Pöppig collected specimens of the bark at the same time with specimens of the plant, and had the former examined by Reichel. This plan has been fully carried out by Dr. Weddell with a still greater number of species. The greatest mistakes have occurred in consequence of Mutis and Zea having taken for granted that the barks of the north were identical with those of the south, and consequently that the trees which yielded the yellow and red barks of Carthagena must be the same as those which produced the yellow and red barks of Lima, a mistake by which they led not only Humboldt into error, but also Mr. Lambert and the authors of the London Pharmacopœia of 1836.

The commercial names of the different Cinchona barks lead to considerable confusion and ambiguity. Thus one or two are named from the place of export, as Carthagena, though they are produced near Santa Fé; others from Lima, the produce of the forests of Huanuco and of Upper Peru; one from Arica, though brought from the interior; while others are named from the places near to which they are produced, as Loxa, Huanuco, Huamalies, Jaen, Carabaya, and Cuzco. These generally indicate the best kinds of their respective districts. But the names are far from distinctive, for other barks are also exported from the same places. They are also named from their physical appearances, chiefly, however, from colour. This is the method adopted in the British Pharmacopœias; the London and Dublin Colleges mention the *Pale*, *Yellow*, and *Red* Barks, but the Edinburgh College substitutes *Crown* and *Silver* Barks for the first. This method was adopted by Bergen in his monograph, pronounced by Dr. Duncan to be "the most perfect specimen of Pharmacography," then by Guibourt in his "Histoire des Drogues," and lastly by Dr. Pereira, and no doubt affords considerable convenience for practical purposes. It is, however, liable to the objection that the names of the same colours are applied to totally different barks in the different Cinchona provinces. Mutis and Zea, moreover, named the barks of Santa Fé from the colour of the powdered bark; while in Peru the barks are named from the external appearance of the bark; or from the white or black lichens which adhere to its surface, the growth of which necessarily depends on local influences of climate and exposure. Mr.

Howard has observed that the method of the botanists of Santa Fé, though open to objection, is capable of being generally appreciated; that the second method is certainly not thus obvious, though he believes very correct; the third method, or that from the lichens, he considers to be altogether deceptive.

Dr. Weddell has proved what had before been inferred from chemical composition, that the barks of the young branches of several species constitute the *pale* barks of commerce, which become *yellow* or *red* in older plants, or in the older parts of the same plants. The barks may, moreover, be arranged according to their chemical constituents, as has been done by Goebel and Geiger. Eventually they must be arranged according to the plants which yield the different kinds of bark, that is as soon as our information is a little more complete. But at present it is preferable to adhere to the arrangement of the Pharmacopœias combined with that of commerce, as this affords certain advantages for practical purposes.

Before proceeding to the different kinds of bark, we may make a few observations on their structure. The bark of trees, as already stated, is composed of two cellular layers below the epidermis, the inner, or liber, being composed of cortical fibres with the proper laticiferous vessels. The outer part of the bark, as it is pushed outwards, dies, and is by Mohl called *periderm*, and the inner living part the *derm*. In the Cinchonas it is the derm which is employed, because it contains the alkali quinine. It is composed either of the *fibrous* layer alone, or united with more or less of the cellular tissue. It is not however in the fibres themselves that the quinine is found, nor in the laticiferous vessels, but it is rather within cells, in the midst of which the fibres are spread. But in Cinchonas where the cellular part is considerable, as in *C. pubescens*,—or in the pale barks which are from the young parts of plants, and where the fibrous part is not fully developed, or found only in the interior half of the bark, and where several fibres are united in bundles,—cinchonine is chiefly found.

The proportion between the fibres and the surrounding cellular tissue most favourable for the secretion of quinine, seems to be where the fibres are short, of nearly equal length, and uniformly dispersed throughout cellular tissue filled with resinous matter, which is interposed in thin layers between the fibres, as is seen in the transverse fracture of *C. Calisaya*. Other barks, equally fibrous, present a different arrangement, inasmuch as the fibres, which are much longer and unequal, their ends being attached one to the other, are often collected together in bundles, especially towards the inner surface, and are thus increased in thickness, with proportional diminution of the interposed cellular tissue. This structure is well seen in the bark of *C. scrobiculata*.

From these facts it would follow, that the fracture of a Cinchona bark ought, to a certain extent, to show its medicinal powers. That is, the quantity of quinine in a fibrous, or of cinchonine in a corky bark. The larger quills may be expected to contain more alkaloid

than those which consist almost entirely of outer layers. The tannin, Dr. W. observes, is found chiefly in the cellular part of the bark. He has named these three modifications of structure,—the first corky, the second fibrous, and the third (filandreuse) filamentous; and he observes that the structure of all the Cinchona barks more or less resembles one or other of these three types. Winckler does not admit all this.

The different barks of the Cinchonas were described by Bergen in his monograph, under nine different heads, derived from the physical properties of these barks. M. Guibourt then arranged them under the divisions of Grey, Yellow, Red, White, and False Cinchonas, and described a great number of varieties. Dr. Pereira adopted these general heads, incorporated much of the descriptions of Bergen (*v.* Elements of Materia Medica), and added greatly to the value of his synonyms in consequence of having exchanged specimens both with Bergen and with Guibourt, and thus identified the German, French, and English names by a comparison of the several kinds of barks. Dr. Christison has been able to confirm many of these results, from having also received many of the same barks. It has been already mentioned that Pöppig having brought home barks of some of the Cinchonas which he had seen growing in their native sites, these were compared with the commercial barks by Reichel; and that the same course has been followed to a still greater extent by Dr. Weddell, in his most admirable work, where he has given representations which rival those of Göbel and Kunze, of several of these barks. Lastly, Mr. J. E. Howard, assisted by Dr. Pereira, has compared the barks of commerce with the collection of Peruvian barks, woods, and plants, which is now in the British Museum, as well as with other collections, and, having identified many, has given much valuable information respecting most of them. (*v.* Pharmaceutical Journal, vols. xi. and xii.)

The following table is slightly altered from that of Weddell, and will be of use in showing the species that produce the various barks. But in afterwards describing the latter, it will be necessary to adopt the simpler arrangement of the Pharmacopœia.

TABLE OF COMMERCIAL CINCHONA BARKS,

WITH THE BOTANICAL SPECIES FROM WHICH THEY ARE BELIEVED TO BE OBTAINED.

I.—GREY CINCHONA BARKS.

§ I.—LOXA CINCHONA BARKS. (Pale Bark,—Crown Bark *Angl.*—China-Loxa, Kron China *Germ.*)

Loxa Cinchona bark, grey compact . .	*Cinchona Condaminea* H. et B.
Loxa Cinchona bark, brown compact. (*Dunkele Ten China* Germ.—*China pseudo-Loxa* Bergen.)	*C. scrobiculata* H. et B.
Loxa Cinchona bark, red chestnut.—Light Calisaya	*C. scrobiculata* H. et B.

Loxa Cinchona bark, red fibrous of the King of Spain (*Quina estoposa* Pavon.	
Loxa Cinchona bark, yellow fibrous . . .	*C. macrocalyx* Pav.

§ II.—Lima or Huanuco Cinchona Barks. (Silver Bark, Grey Bark *Angl.*—China-Huanuco, Graue China *Germ.*)

Lima Cinchona bark, grey brown (*Cascarilla provinciana* Peruv.) . . . . . . Lima Cinchona bark, grey ordinary . .	*C. micrantha* Ruiz et Pav. or *C. lanceolata* Ruiz et Pav.
Grey bark. Fine Grey bark	*C. nitida* Ruiz et Pav.
Lima Cinchona bark, white	? *C. purpurea* Ruiz et Pav.
Lima Cinchona bark, very rugous, resembling the Calisaya bark. — *Cascarilla negrilla* Peruv. (? *Cascarilla lagartijada* Laubert.)	*C. glandulifera* Ruiz et Pav.
Cinchona bark, red of Jaen or of Loxa . .	?

II.—WHITE CINCHONA BARKS.

Ash-coloured Loxa Cinchona bark (*Ash bark* Angl. — *Blasse Ten-China* Germ. — *China Jaen* Bergen) . . . . . . Grey Cinchona bark, pale ditto . . . White Loxa Cinchona bark . . . . White fibrous Jaen Cinchona bark . . .	*C. ovata* Ruiz et Pav.
Cuzco Cinchona bark . . . . . . Arica Cinchona bark	*C. pubescens* Vahl., or *C. cordifolia* Mutis.
Pale Yellow Carthagena Cinchona bark.—(*Hard Carthagena bark* Angl.—*Quina amarilla* Mutis.—*China flava dura* Bergen) . Orange-yellow Carthagena Cinchona bark (*Quinquina de Maracaibo.* — *China flava fibrosa* Bergen)	*Ibid.*
Pitayon Cinchona bark, or false Pitaya Cinchona bark	? *Stenostomum acutatum* D. C.

III.—YELLOW CINCHONA BARKS.

Yellow Cinchona bark of the King of Spain (*Cascarilla amarilla del rey.* Laubert.) . Calisaya Cinchona bark, or Royal Yellow bark (*Konigs China* Germ.—*Yellow bark* Angl.—*China regia* Bergen)	*C. Calisaya* Wedd.
Orange-yellow Cinchona bark—Cinnamon Cinchona bark (*quinquina—cannelle*), light Calisaya (*cascarilla claro amarilla* Laub.) .	*C. micrantha* Ruiz et Pav.
Pitaya Cinchona bark (*Quinquina de la Colombie ou d'Antioquia* Guib. Hist. Nat. des Drog. —*Cascarilla parecida a la Calisaya* Laubert) Woody Carthagena bark (*Quinquina de Colombie ligneux*)	*C. academica?* *C. Condaminea* Humb. et Bonp.
Orange Cinchona bark of Mutis (*Spongy Carthagena bark; New Spurious Yellow bark* Pereira)	*C. lancifolia* Mutis.

Huamalies Cinchona Bark. (Rusty Bark *Angl.*—China Huamalies, Braune China *Germ.*)

Huamalies Cinchona bark, dull grey . .	*C. hirsuta* Ruiz et Pav.
Huamalies Cinchona bark, thin reddish . .	? *C. purpurea* Ruiz et Pav.

Huamalies Cinchona bark, white	?
Huamalies Cinchona bark, ferruginous . .	*C. micrantha* Ruiz et Pav.
Yellow Cinchona bark of Cuenca . . .	*C. ovalifolia* H. et B.

IV.—RED CINCHONA BARKS.

(Red bark *Angl.* Rothe China *Germ.*)

Red Cinchona bark, becoming white in the air	?
Red Cinchona bark of Lima	*C. nitida* Ruiz et Pav.
Red Cinchona bark true, non-verrucous (*Cascarilla roja verdadera*, Lambert) . .	*C. nitida* Ruiz et Pav.
Red Cinchona bark, officinal	*C. nitida* Ruiz et Pav.
Red Cinchona bark true, verrucous . .	*C. nitida* Ruiz et Pav.
Orange-red Cinchona bark, verrucous . .	?
Pale-red Cinchona bark with a white surface	?
Brown Carthagena bark	?
Red Carthagena bark	?

The following, according to M. Guibourt, are the most active barks:—

1. Calisaya Cinchona bark.
2. Yellow orange ,,
3. Pitaya ,,
4. Verrucous true red ,,
5. Non-verrucous true red Cinchona bark.
6. Red Lima ,,
7. Grey Lima ,,
8. Verrucous white Huamalies ,,

(Weddell, *Hist. Naturelle des Quinquinas*, fol., 1849.)

A. Cinchonæ pallidæ, the Pale Barks, the *quinquinas gris* of Guibourt, are almost always quilled, moderately fibrous, and more astringent than bitter. Their powder is usually of a greyish fawn colour, but sometimes the grey barks are not only produced by several different species, but they very frequently are the young bark of the same trees, which in the older parts yield the yellow and red Cinchonas. They contain *Cinchonia* and little or no *Quina.* With regard to chemical composition there is also some uncertainty, for it has been fully proved that the same botanical species furnishes barks differing in chemical constituents, according to the influence of age and of local circumstances. An infusion of Pale Bark does not deposit any Sulphate of Lime on the addition of a solution of Sulphate of Soda.

1. Crown or Loxa Bark. Cinchona pallida (de Loxa), L. Cinchona Coronæ, E. C. Condaminea, L. Cortex, L. Bark of Cinchona Condaminea, *H.* and *B.*, E. D. Quinquina gris-brun de Loxa, *Guibourt.* China Loxa, *Bergen.* *C. fusca*, G. and K. (v. p. 1–9 : vi. p. 1–5. .

This kind of Bark was one of the first introduced into Europe. It is always in quills or cylindrical tubes strongly rolled, usually single, from 6 to 15 inches in length, and varying from 2 lines to an inch in diameter, and from half a line to 2 lines in thickness. The epidermis is entire, of a light or dark grey, sometimes even of a brownish colour, often covered with white crustaceous lichens. The outer surface is

marked with numerous longitudinal wrinkles, of little depth, or crossed by transverse cracks, which often run entirely round the bark, dividing it into rings, the edges of which are somewhat elevated. The inner surface is smooth and uniform, and of a cinnamon-brown colour, as is the powder. The middle-sized quills are probably the best. The taste is astringent and bitterish, with a little aroma. The odour is compared by Bergen to that of Tan, but it has a slight degree of aroma. It is imported in chests and serons, and is collected in the woods round Loxa and on the neighbouring mountains of Peru. There seems no doubt of this bark being produced by Cinchona Condaminea of *H.* and *B.*

Cinchona Condaminea (fig. 74) is a tree about 30 to 45 feet in height, with opposite branches, which are horizontal in the lower parts, but form above an

Fig. 74.

Cinchona Condaminea.

acute angle with the stem, smooth, as high as the inflorescence, with lanceolate leaves, ovate or somewhat roundish, usually acute, above very smooth, shining, below sometimes pitted in the axils of the veins; calycine teeth triangular-acuminate or lanceolate; filaments about half the length of, or longer than, the anthers; capsule oblong-ovate, scarcely twice as long as broad. (*Weddell.*) Peduncles panicled, corymbose in the axils of the upper leaves, forming a large loose thyrse, covered with a thick short down. Tube of the calyx downy, like the pedicels; limb very short, urceolate, 5-toothed, pubescent. Tube of the corolla slender, about four times as long as the tube of the calyx, tomentose; limb very shaggy internally. (*Lind.*)

Dr. Weddell unites under this head several species of Cinchona of other botanists—under the varieties of, α. *vera*, Loxa. β. *Candollii*, Cuenca. γ. *lucumæfolia*, Loxa. δ. *lancifolia*, Peru, Æquator, and New Granada. ε. *Pitayensis*, New Granada. Thus deciding the much disputed point of the identity or difference of the species growing in New Granada and near Loxa, by uniting the *C. lancifolia* of Mutis, yielding the orange-bark of Santa Fé, with *C. Condaminea* of Humboldt, which grows near Loxa, and yields the *Quinquina de Uritusinga*, or the finest crown bark. He speaks, however, with some diffidence, as he had never seen any of the above varieties growing in their natural sites, and recommends it as very desirable, to compare carefully together the barks of these different varieties in individuals of the same age. *C. Condaminea* occupies a belt of vegetation extending from 5700 to 7700 feet, (or from 1600 to 2700 metres, *Caldas*) above the sea, having a mean temperature of from 64° — 68° Fahrenheit, (14° — 15° centigrade, *Caldas*). The variety *C. lancifolia* may be found at as great a height as near 10,000 feet, and whence it must be exposed in cold nights almost to frost.

This, the first known species, was that intended under the name of *C. officinalis*. It was most wastefully cut down before even the year 1779 in Peru, and therefore one of the finest varieties of the Loxa bark, that is, the Cascarilla fina de Uritusinga, is seldom, if ever, now met with in commerce.

Uritusinga formed the choicest bark for the Royal Pharmacy, hence it was called Crown bark. Several kinds of bark are yielded by the different varieties of this species. These chiefly yield Cinchonine, but some contain a small quantity of Quinine. Pitaya bark yielded most Quinine to Guibourt. The barks generally correspond with the *quinquina gris-brun de Loxa* of Guibourt, while others resemble the Crown bark of commerce, also the grey-brown, or rusty-brown, perhaps the *knotty* of Jussieu, including the Chaharquera de Loxa, which is probably the Huamalies of Bergen.

Mr. Howard found some fine specimens of the Uritusinga or Crown bark, though old, to contain per cent. of Quinine ·714, Quinidine ·514, Cinchonine ·04, even in small quills, while the larger are richer in alkaloids. He therefore concludes that the old crown bark was rich in the quantity of alkaloids it contained, "which, taking the whole together, for the bark is rich in Cinchonine and Calisaya is not, equals the sum total of alkaloids in some specimens of good Calisaya bark."

On the contrary, some very fine Crown bark of the present day yielded him only per cent. Quinidine, crystallized from Ether, ·57, Cinchonine ·06, while some fine H. O. bark, which was one of the brands adopted for one kind of Crown bark, and is now applied to the

Crown bark of commerce yielded him per cent. of Quinidine, crystallized from Ether, 1·05, Cinchonine ·08.

The present H. O. or Crown bark was supposed to be yielded by *Cinchona scrobiculata;* but this has not been confirmed by Weddell's observations, though Humboldt stated that there were very extensive forests of *C. scrobiculata*, and that large quantities of the bark were exported from Payta, the nearest port to Loxa.

Pöppig discovered that the bark called *Cascarilla nigrella* in Peru, and much esteemed there, was obtained from *Cinchona glandulifera* of *R.* and *P.* when growing on high mountains near Huanuco and Cuchero. It came formerly from Lima, and appears equal to the finest from Loxa. Mr. Howard having compared the specimens of this bark with the H. O. bark of British commerce, concluded that they were identical. Another kind, inferior in quality, called *Cascarilla provinciana nigrella,* is produced by the same tree when growing in warm valleys.

The *Cascarilla fina de Loxa*, also yielded by this species, has been recently imported. Dr. Pereira and Mr. Howard found fourteen chests of this in 613 packages. The "Silver Crown" and "Leopard Crown" formed a large proportion of other chests. Also the variety with corky coat and silvery epidermis, known as "Silver Crown," and which is probably yielded by the variety γ *Lucumœfolia.* Some fine specimens are not unfrequently received from Payta, but are looked upon as verging more upon the rusty crown than upon the silver crown barks. The black, or *quina-negra*, has also been imported of late, and, though an inferior bark, is a product of a variety of this species; also the *quina estoposa* (*stupea*, tow) *de Loxa*, or fibrous specimen of *lancifolia*, but which so closely resembles the *fibrous Carthagena*, and of which specimens have come from Payta mixed with ashy crown bark. The barks yielded by *C. condaminea*, and its variety *C. lancifolia*, belong altogether to the better description of barks, judging by the quantity of the different alkaloids which they contain, and of this there has of late been considerable experience as, owing to the high price of the superior barks of Bolivia, they have been extensively employed in the manufacture both of Quinine and of Cinchonine (P. and H.)

2. Grey or Silver Bark. Cinchona cinerea, E. P. Barks of *C. micrantha* and of *C. nitida*, R. and P. Huanuco bark, D. P. China Huanuco, *Bergen*, Quinquina de Lima, *Guibourt.*

This kind of pale bark was first introduced into Europe about the beginning of the present century. It obtained its name of Lima from the place of export, and that of Huanuco from the city in Central Peru, near which it is produced. It resembles the last kind in its dimensions, but is rather longer and coarser. It occurs in quills with a greyish epidermis. Many of the smaller have a more or less complete spiral form, and a large oblique slit is observable at the edge of most of the complete quills. It is less wrinkled longitudinally than

crown bark, and the transverse fissure less generally runs entirely round, with the edges not elevated. On the inside it is rather more of a red colour, more or less uneven and fibrous, but its powder is nearly of the same Cinnamon-brown, and similar to it in odour and taste. Bergen says the odour of the bark is like that of clay, and in this respect different from that of all other varieties.

C. micrantha (T. xiv. xv. Wed.) delights, more than any other species which Dr. W. has seen growing, in shady and moist places, and in the province of Carabaya near torrents. Its bark is known in commerce under the name of Huanuco bark. One variety resembles the *Calisaya*, and also the orange-coloured Quinquina of Mutis. Other sorts are known as coarse and inferior Huanuco barks of commerce. One kind appears to be the *Pata de gallinazo*, which was gathered by Pöppig in the forests of Cuchero, and obtained from the younger and upper branches of *C. micrantha*, while the *Cascarilla provinciana* is from the larger boughs. This Huanuco bark is often found mixed with the *grey bark* of *C. nitida* mentioned below. "The *C. micrantha* furnishes in Peru the second-rate qualities of *grey bark*, in Bolivia the same tree produces second-rate varieties of *Calisaya*, which pass in commerce as light and flimsy sorts of Bolivian bark." (*Howard.*) The *inferior grey bark* yielded Quinine, ·243, Quinidine, ·28, Cinchonine, 1·25. Total, 1·773 per cent. Bark, G. and K. T. vi. f. 6-8.

The bark of *C. nitida* is not quite so dense, but is more resinous, and the outer coat more even than that of *C. condaminea*. Mr. Howard says, that the bark of *C. nitida*, which is the *Quina cana legitima*, or "genuine grey bark" of Laubert, still keeps its ground, and forms the finest samples in the drug market in England; also that in a recent sale he found it in the following proportion: thirty chests of *C. nitida* unmixed; 100 chests mixed with *C. micrantha;* and from 30 to 40 chests almost all *micrantha*. All this sold as "grey bark," but the *nitida* was reckoned the finest.—*C. nitida*. T. x. A. *Wed.*

M. Guibourt identifies it with his *rouge de Lima*: he found it very rich in Cinchonine and in Quinine, as is also the case with commercial red bark. Mr. Howard obtained about ·571 Quinine, ·142 Quinidine crystallized, and 1·4 Cinchonine. Total, 2·113 per cent.

3. *Ash or Jaen Cinchona*, apparently produced by *Cinchona ovata*, Fl. Per., is distinguished by its thin light coat, readily pulverized, cracks few, quills mostly crooked. Colour dark cinnamon-brown. (*Bergen.*) From one of its names, it would seem to come from near St. Jaën de Bracomoras. G. and K. T. x. f. 6-9.

Cinchona ovata is thought by some to be a variety of *C. cordifolia*, Mutis, or of *C. pubescens*, Vahl. With the exception perhaps of *C. Condaminea*, no species is more liable to vary with the soil and climate, especially in its bark. It is known in Peru under the name of *Cascarilla Carabaya*, where it is collected to adulterate Calisaya bark; and it is probable that several of the barks of Loxa and of Huanuco are produced by this species. Mr. G. recognized one as the *q. de Lima gris fibreux*. Dr. Weddell thought that this species, especially his *var. erythroderma*, might yield the *q. q. rouge vrai*. Carabaya bark, a spotted variety, which approaches ashy bark in character, and which has been recently introduced here, has frequently mixed with it what is called Huamalies bark in Germany. One sort of its bark is like "ash bark." Mr. H. found in even a poor specimen of ash bark, Quinidine, crystallized, 0·61; Cinchonine, crystallized, 0·86. The prejudice against it, therefore, is unjust. One kind called ashy crown bark in English commerce, and of which considerable quantities have of late years been introduced, and which is also called *Quinquina Loxa cendré*: is the produce of *C. cordifolia*. Mr. H. found in ashy crown bark of Quinine and Quinidine, 0·457, and of Cinchonine, 0·3 per cent. It is, therefore, a tolerably efficacious bark, and large quantities have of late been sold for pharmaceutic purposes.

4. *Huamalies or Rusty bark*, comes from Lima, and is the produce of *C. pubescens*, *Vahl.* (the *C. purpurea* of Fl. Peruv.), it is distinguished by its coat, thin and

spongy longitudinal wrinkles and wart-like elevations, which penetrate to the cortical layers; under surface even; colour red brown. G. and K. T. f. 1-5. (*Bergen*, as given by Pereira.) Yielded to Göbel and Kunze 3·8 per cent. of Cinchonia, and 2·8 per cent. of Quina.

The Huamalies is one of the better and more efficacious barks; but it might be arranged with the red barks. The Huamalies district is unexplored, and the source of this bark therefore unknown. Mr. Howard thinks that the *Cinchona Chaharquera* of Peru, is very near to, if not identical with, the Huamalies bark. This is made a variety of *C. condaminea.*

5. White Loxa bark is sometimes found intermixed with the Crown or Lima Cinchona, but is to be distinguished by its white epidermis.

B. Cinchonæ flavæ. Yellow Barks.

6. Cinchona flava (regia), L. E. D. Cinchona Calisaya, *Weddell.* Quinquina jaune royal, *G.* König's China. *Bergen.* Yellow Bark. Royal Yellow Bark. G. and K. Taf. viii. f. 1-6.

The Yellow Bark of commerce appears to have been first introduced into Europe about the year 1790. The tree producing it was till very lately unknown, the usual reference to *C. cordifolia* of Mutis being erroneous. Yellow bark is imported from southern ports, such as Coquimbo, as originally stated in the United States Dispensatory, but chiefly from Arica, whence it is sometimes conveyed to Lima. Yellow bark is produced in hot forests, growing on steep and rugged mountains at elevations of five and six thousand feet, between 13° and 16° of S. latitude, in Bolivian provinces to the eastward of La Paz and in the Peruvian provinces of Carabaya, and is known there by the names of *Cascarilla Colisaya* and *Calysaya.* (Colli-salla, *Pöppig*). It is imported in chests and serons, and two kinds are known, *quilled* and *flat* Yellow Bark.

The *quilled*, called *Calisaya rolada*, or *rolled*, is in pieces from 3 and 4 to 18 inches in length, and from a $\frac{1}{4}$ to 2 or 3 inches in diameter, and varies in thickness from $\frac{1}{8}$ to $\frac{1}{3}$ of an inch, in general only singly quilled. The epidermis is brownish, often mottled by whitish or yellowish lichens, marked by longitudinal and transverse fissures, and generally easily separated from the bark; sometimes in the larger pieces very rough from the furrows and cracks. Its inner surface is smooth but fibrous, and of a yellow cinnamon colour. The transverse fracture is short but splintery, and the powder contains spiculæ which are irritating to the skin. The *flat* Calisaya, or *Calisaya plancha*, appears to have been derived from the trunk and larger branches; it may be quite flat or slightly curved, and being destitute of epidermis, is of a yellowish colour on both sides, but more fibrous in structure. The powder is of a yellow orange-colour; taste less astringent but more bitter than the pale bark: that of the flat bark is less bitter than the quilled. Yellow bark contains a large proportion of Quina, and very little Cinchonia. Sulphate of Soda produces an abundant precipitate of Sulphate of Lime in its infusion.

Cinchona Calisaya.—Leaves oblong or lanceolate-obovate, obtuse, attenuated

at the base, rarely acute on both sides, smooth, polished or pubescent beneath, scrobiculate in the axils of the veins. Filaments usually shorter than one-half the length of the anthers. Capsule ovate, scarcely equal in length to the flowers. Seeds frequently fimbriate-denticulate at the margin.

There are two varieties of this, which is the most valuable species of Cinchona, because yielding the yellow bark of commerce.

α. *Calisaya vera.*—A tall tree, with obtuse, oblong, obovate, or oblong-lanceolate leaves. Trunk straight or bent, naked, not unfrequently twice the thickness of a man's body. The leafy head (*coma*) for the most part elevated above all the other forest trees.

Bark of the trunk thick. The periderm mostly thicker than in other species of the genus, easily separable from the liber, and, when separated, exposing on the surface of the latter, furrows or impressions resembling carvings; furnished with vertical parallel fissures, and transverse, more or less, annular markings; whitish or also blackish. Periderm of the branches whitened or variously marbled by the thalli of lichens; and marked by rather sinuated fissures and

Fig. 75.

Cinchona Calisaya.

A. Fructiferous branch. (From a specimen collected by Weddell in the province of Carabaya, in Peru.) B. Flowers. C. Corölla laid open (magnified in proportion.) D. Capsule (magnified in proportion). E. Seed (magnified in proportion). F. Leaf of var. *Josephiana.* (From a specimen gathered in the province of Yungas, in Bolivia.)

narrower markings. Bark of the branchlets thin, smooth, and brownish olive-coloured or blackish. It grows in declivities and steep and rugged places of the mountains, at an altitude of from 5000 to 6000 feet, in the hottest forests of the valleys of Bolivia and Southern Peru; between 13° and 16° 30′ south latitude, and from 64° to 70° west longitude; in the Bolivian provinces near La Paz of Enquisivi, Yungas, Larecaja or Sorata, and Caupolican or Apolobamba; and in the Peruvian province of Carabaya. It flowers in April and May.

β. *Josephiana.*—A shrub with somewhat acute, oblong-lanceolate, or ovate-lanceolate leaves; 6 to 10 feet high, with a slender branched trunk of from three to five centimetres thick. Branches erect. Bark adhering firmly to the wood; that of the trunk and branches schistaceo-blackish, smoothish, or furnished with different lichens, and marked in an annular manner by some narrow, distant scissures; that of the branchlets reddish-brown.

This variety is called both *Ichu Cascarilla* and *Cascarilla del Pajonal*, both names signifying herbaceous Cinchona. Dr. Weddell, after careful study, determined that this was a variety, and not a distinct species. He has frequently observed it, for instance, on the mountains of Tipoani, and in passing from a *pajonal*, or meadow, to a cut wood, and thence to a thick forest, has seen the various modifications which the Ichu Cascarilla assumes in form and appearance. The colour and texture of its different parts indicate the influence of local circumstances. Hence the coriaceous leaves, with highly-coloured nerves, and stiff petioles; or, on the contrary, the soft and velvety green leaves which distinguish the Cinchona Calisaya, and the flaccid petioles. Finally, when the summit of the adult plant rises above the neighbouring trees, its organs reassume some of the characters of the Ichu Cascarilla. The external surface of the bark, when bruised, exudes a yellowish gum-resinous matter, bitter and astringent. It is this which fills up the cells of the derm, and which escapes from fissures in the young bark. The consistence of the bark when first removed from the tree, may be compared to that of a mushroom, and it may be broken with the greatest facility in any direction. When the dry bark, as met with in commerce, is handled, a multitude of little prickles run into the skin, and form one of the distinguishing characteristics of good yellow bark.

OTHER YELLOW BARKS.

7. *Hard Carthagena Bark*, China flava dura, *Bergen*, the *Quina jaune* of Humboldt, the *Quina amarilla* of Mutis, and the produce of his *Cinchona cordifolia*, which grows in the forests of New Granada, is that which has been mistaken for the foregoing yellow Calisaya bark. G. and K. Taf. ix. fig. 1-4. It is distinguished by its epidermis being velvety, greyish-white, thin and soft, or warty, longitudinal furrows irregular, few transverse fissures; under surface uneven or splintery; colour dull citron-yellow. (*Bergen.*) Göbel and Kirst obtained in ℔j. about 56 grs. of Quina in this and the following, and of Cinchonia 43 grs. in the former, but none in the fibrous bark.

8. *Fibrous Carthagena Bark*, China flava fibrosa. G. and K. taf. ix. fig. 5-8. Occurs with the foregoing, whence Dr. Pereira suspects it may be produced by the same species, either in different seasons or in different localities. Coat thin, soft, of moderate thickness, or rubbed off; under surface even, but rough to the touch; colour pure ochre-yellow.

C. cordifolia of Mutis includes the *C. rotundifolia* of Lambert and Lindley. It is found both in New Granada and in Peru, in moist and shady woods at altitudes of from 4000 to 7000 feet, throughout almost the whole of the Cinchona regions. It is also the most northern in its distribution, having been found near Caraccas; but it was also discovered near Santa Fé de Bagota, where it yields the barks known as *hard Carthagena barks* in English commerce. This name is applied to the produce both of *C. lancifolia*, and of *C. cordifolia*. When the produce of *C. lanceolata* is shipped from a port on the Pacific, this, from its resemblance to *C. lancifolia* bark (the *Quina estoposa* de Loxa), is also called Carthagena bark. The Carthagena barks of Mutis have, in consequence of the

high price of Bolivian, been extensively tried, and found to be possessed of active properties, and useful for separating the alkaloids.

9. *Orange Cinchona of Santa Fé.* Quinquina de Carthagene spongieux, G. l. c. p. 78, is the *Quina naranjada* of Mutis, and produced by his *Cinchona lancifolia*, which is so frequently stated to be the species yielding only pale bark.

10. *Cusco Bark*, first described by Guibourt, is the *China rubiginosa* of Bergen, and may by some be mistaken for Yellow Calisaya bark. Its epidermis is shining, pale grey, without fissures; the naked surface is orange-red. But Dr. Pereira has pointed out that it may be distinguished by Sulphate of Soda not producing any precipitate in its solution. Guibourt obtained of Cinchonia about ʒj. from a pound of bark.

What is called Cusco bark in Peru, is the produce of *Cinchona scrobiculata*, and is of little value. Another kind is yielded by *C. pubescens* var. *Pelleteriana* of Weddell; but what is chiefly known in English commerce by that name, is yielded by *C. pubescens* var. *purpurea*.—P.

C. pubescens, though resembling, is yet very distinct from *C. cordifolia*. It is one of the species which was included under *C. officinalis*; and is found in the lower forests of the mountains of Peru and of Bolivia, between 4° and 16° of S. latitude, near Santa Anna de Cuzco and in Carabaya.

C. pubescens var. *β. purpurea*,—Weddell, the *C. purpurea* of Pavon. This bark is of a light grey, or dark brown, with a few warts and wrinkled epidermis; sometimes found in commerce, being of comparatively little value, is used for adulteration. In the province of Carabaya, Dr. Weddell found it called *Cascarilla*, or *Quina Amarilla*, the name which Mutis gave to his *C. cordifolia*. "The two barks are indeed extremely alike."—W.

Its bark was recognized as that from which the alkali *aricina* was obtained; but this is considered to have been only *Cinchonine* modified by the process of extraction. It is described by the name of *Quinquina de Cusco* by M. Guibourt. It contains both Quinine and Cinchonine, but only in small quantity.

The *Cascarilla boba* (fool's, or worthless, bark) was supposed to be Huamalies bark by Reichel, who examined the barks brought by Pöppig, but he seems to have been mistaken in their identification; it is yielded by a variety of *C. condaminea*.

C. Cinchonæ Rubræ, or Red Cinchonas.

11. Cinchona rubra, L. E. D. Cinchonæ species incerta; Cortex, L. Red Cinchona Bark, from an undetermined species, E. D. Rothe-China, *Bergen.* Quinquina rouge, or Cascarilla colorada of the Spaniards. G. and K. Taf. xi. f. 1-5.

Red Cinchona Bark was early known, but not distinguished in England until 1779. It is imported from Lima in chests, but the species yielding it is still unknown. *C. magnifolia*, Fl. Peruv. the *C.* (now Cascarilla), *oblongifolia* of Mutis yields a different and inferior kind of bark, the *Quina nova*, the purple red Cinchona of Santa Fé: No. 12.

Red Bark is usually imported from Guayaquil, but also from Payta. The districts where it is said to be produced are Riobamba and Cuenca, and therefore near to Guayaquil, but it also comes from near Jaen farther to the south, and therefore probably from the intermediate districts. M. Guibourt is of opinion that the *Red* colour is not peculiar to any one species of bark, but that it depends on accidental circumstances, as exposure, the art and mode of drying. Dr. Weddell's observations confirm this view. He has observed the red shade in the bark of *C. ovata*, also in *C. scrobiculata*, in *C. pubescens*, and even in *C.*

Calisaya. And he believes, therefore, that the yellow and red barks of Loxa are furnished by varieties of the same tree. The observations of La Condamine, of J. de Jussieu, of Caldas, as well as of Humboldt, lead to the same conclusion ; it is possible, therefore, that the differences of colour may not be characteristic of any particular species. Dr. Pereira and Mr. Howard in their examination of the barks of Peru found one (No. 45) which is labelled "*Quina Colorada del Rey de Loxa*," also "*Cinchona Colorada de Huaranda*," stated to be the produce of *Cinchona succirubra* of Pavon's MSS. It is quite like commercial red bark, the coat is like that of *Condaminea*, but easily detached (some pieces are quite deprived of coat) and showing various *crater-like* elevations and depressions such as occur on red bark. The substance brown, red, brick-coloured. The transverse cracks rather distant. Mr. H. observes that "The *Cinchona succirubra* (red juice), whatever its botanical origin is, I think, commercial red bark.

Red bark is received in quilled, but most frequently in flat or rather curved pieces, varying in length from a few inches to two feet, from one to five inches in breadth, from a quarter to three-quarters of an inch in thickness. The pieces are usually covered with epidermis, which is of a greyish or reddish-brown colour, sometimes mottled with purple or with white from adhering lichens, though these are less frequent than in others; but it is often rough, wrinkled, and warty, forming the variety *verruqueux* of G. On the inside its surface is coarsely fibrous, and of a deep cinnamon-brown, but it looks of a red colour when placed near the other barks, and especially in the thicker pieces. The fracture is short, fibrous, and splintery. The powder is of a reddish-brown colour; the taste is powerfully bitter, with a slight degree of aroma. It is more scarce than the other kinds, and is remarkable for yielding both Quina and Cinchonia.

12. *Red Cinchona of Santa Fé. (Per.)* Quinquina nova of authors. Quina roxa or Azahar of Santa Fé. An inferior kind of Carthagena Bark of a red colour, with white epidermis, containing little or no Quina or Cinchonia. It is produced by *Cascarilla* (formerly *Cinchona*) *magnifolia*, Fl. Per. (*C. oblongifolia*, Mutis), G. and K. taf. xi. f. 6 to 9. (The genus *Cascarilla* has been separated from Cinchona by Weddell.)

13. *Red Cinchona*, with a white micaceous epidermis, mentioned by Guibourt and Pereira.

The physical characters of the Cinchona barks are chiefly important as indications of their richness in the principles which make them so valuable as medicinal agents. In 1802, so little was known of these, that Seguin concluded that the active principle was of the nature of Gelatine. In 1803, Dr. Duncan detected a new principle, which he named Cinchonia, and which was isolated by Gomez in 1810. And in 1820, Pelletier and Caventou discovered Quina, proved that this and Cinchonia were alkaloids, combined with Kinic acid, and further cleared up the chemical constitution of the barks. Subsequently, Pelletier and Coriol discovered a third alkaloid, Aricina, in

Cusco bark; and during the last few years Quinidia, discovered by Winckler, has been added to the list.

The chemical constituents of the Cinchona barks will now be briefly noticed in succession. The list comprises four alkaloids, five acids, and seven other ingredients. The Alkaloids are,—*Quina*, *Cinchonia*, *Quinidia*, and *Aricina*. The Acids,—*Kinic*, *Sulphuric*, a variety of Tannic acid called *Cincho-tannic*, an acid called *Cincho-fulvic* or *Red-Cinchonic*, and *Kinovic* acid. Besides these there are generally found a *Fatty matter*, some *Volatile oil*, and *Salts of Lime*, along with *Resin*, *Starch*, *Gum*, and *Woody fibre*.

Quina, or Quinine, is contained in the largest quantity in Yellow bark; exists also in the Red barks; but is found only in small amount, or not at all, in the Pale barks. Its formula, according to Liebig, is $C_{20}\,H_{12}\,NO_2$. This formula has been confirmed by Regnault and others, but is disputed by Laurent. This important base exists in the barks chiefly as Kinate of Quina, but partly in combination with the other acids of Cinchona. It may be obtained by precipitating with Ammonia a solution of its Sulphate. When thus obtained, it is a white powder, but with very great care it may be crystallized from its alcoholic solution in minute silky needles. (Cinchonia and Quinidia may be separated from it by the much greater ease with which they crystallize.) It is without odour, but has a very bitter taste. Whether amorphous or crystallized, it is a hydrate, and loses its water on the application of heat. It then fuses, and is afterwards entirely destroyed. It is comparatively insoluble in cold water, but dissolved by 200 parts of boiling water. It is very soluble in Alcohol and Ether. Its solutions have an alkaline reaction. It forms salts with acids, which are more or less soluble in water, alcohol, and ether, and are distinguishable by certain tests. Some of these salts contain 2 equiv. of the base to 1 of the acid. They are more insoluble than the neutral salts. A solution of a salt of Quina yields a precipitate of the alkaloid on the addition of Ammonia or Carb. Soda, and of Tannate of Quina with solutions containing Tannic acid. The reaction with the Chlorine test, discovered by Brandes, is characteristic of Quina. If to one of its solutions some Chlorine-water be first added, and afterwards Ammonia, an emerald-green colour is produced. A solution of a salt of Cinchonia produces a white precipitate with these re-agents. A solution of Quinidia is unaltered. Dr. Vogel has observed some other reactions of the same kind, which he considers to be also highly characteristic of Quina. He states that if Potash is added to the Quina-solution and Chlorine-water, a sulphur-yellow colour results; or if, instead of this, a strong solution of Ferrocy. Potassium, a dark red is produced, which after some hours passes into green. These changes do not occur with Cinchonia. (*v.* QUINÆ DISULPH.)

Cinchonia (or Cinchonine) exists in Pale, Grey, and Red barks. Formula $C_{20}\,H_{12}\,N\,O$, containing one atom of oxygen less than Quina. Like Quina it is white and colourless, has an alkaline

reaction,—a bitter taste, forms with an atom of water a crystalline hydrate, and unites with acids to form crystalline salts. It is far more insol. in water even than Quina, requiring 2500 parts of cold, or 1500 of boiling water. It is also nearly insoluble in Ether. Its salts are more soluble in water than those of Quina. It likewise differs from the latter alkaloid in crystallizing with facility from an alcoholic solution in 4-sided prisms. Its reaction with the Chlorine test is different from that of Quina.

Quinidia, called also Quinidine, and Beta-Quinine, was discovered some years since by Winckler in a bark resembling Huamalies, and in Maracaibo bark. It is found in large quantities in the cheap barks lately imported from New Granada. Fibrous Carthagena bark, the produce of *Cinchona cordifolia*, contains most of it, but it may also be obtained in less quantities from most of the barks of Peru and Bolivia. It exists in company with resin in the substance called *Quinoidine*, or *Amorphous Quinine*, which is left as an uncrystallizable residue in the fluid from which Disulphate of Quina has been obtained.

It is said by Van Heijningen to be isomeric with Quina, which it also resembles in its alkaline reaction and bitter taste. It is soluble in the cold in 1500 parts of water, 45 of absolute alcohol, and 100 of ether; at boiling temperatures, in 750 of water and 3·7 of alcohol, being deposited on cooling. It may be separated from Quina by its property of crystallizing readily from an alcoholic or ethereal solution, in large clear rhomboidal prisms. Its salts very much resemble those of Quina. It forms a basic sulphate similar to *Quinæ Disulph.* but probably differing from it in the amount of water of crystallization. It is rather softer and more woolly in appearance than the latter salt, from which also it differs in being about eight times more soluble in boiling distilled water, and in the non-production of the green colour produced in the solution of the other by Chlorine-water and Ammonia. (*v.* QUINÆ DISULPH.).

Aricina, or Cusconia, is an alkaloid which was announced by Pelletier to exist in Cusco bark. But its existence as a distinct base is doubtful, and is denied by M. Guibourt, who considers the supposed Aricina to be merely impure Cinchonia (?). It was said to have the formula $C_{20}\,H_{12}\,N\,O_3$, containing one more equiv. of Oxygen than Quina. It was found to be soluble in ether, and to turn green with Nitric acid.

From the remarkable resemblance in properties between the above three alkaloids, some chemists have been inclined to refer them all to a supposed base, *Quinogen* ($C_{20}\,H_{12}\,N$), of which Cinchonia, it is thought, might be a Protoxide, Quina a Dentoxide, and Aricina a Tritoxide. It is, however, to be objected to this that the very existence of Aricina is uncertain; and, moreover, that some late analyses of the Cinchona alkaloids, some made by M. Laurent, others by Mr. Leers, would seem to indicate a different set of formulæ than those which have been hitherto adopted. These formulæ may be thus contrasted:

	Liebig and Van Heijningen.	Laurent and Leers.
Quina	$C_{20}\,H_{12}\,N\,O_2$	$C_{38}\,H_{22}\,N_2\,O_4$
Quinidia	$C_{20}\,H_{12}\,N\,O_2$	$C_{36}\,H_{22}\,N_2\,O_2$
Cinchonia	$C_{20}\,H_{12}\,N\,O$	$C_{38}\,H_{22}\,N_2\,O_2$
Aricina	$C_{20}\,H_{12}\,N\,O_3$	

According to the second set of formulæ the alkaloids must differ more in chemical construction than is usually supposed, and their basic salts must be regarded as neutral.

A volatile oily base, called *Quinoleine*, may be obtained by distilling any of the Cinchona alkaloids with caustic potash. It somewhat resembles Conia; has a peculiar smell, and contains no oxygen. It has not an alkaline reaction, though it combines with acids.

Kinic acid, with which the greater part of the alkaloids is probably combined in the barks, is an acid somewhat resembling Acetic, soluble in 2 parts of water, also in alcohol and ether, and crystallizing like Tartaric acid. Its formula is $C_{14}\,H_{11}\,O_{11}$, H O.

Sulphuric acid is contained in small quantities in most of the Cinchona barks.

Cincho-tannic acid is a modification of common Tannic acid. Like the latter, it precipitates solutions of Iron, of Emetic Tartar, and of Gelatine. But it differs from it in its formula, which is said to be $(C_{14}\,H_6\,O_7+2\,H\,O)$; in its salts being rather more soluble than those of Tannic acid; and in a peculiar property which it possesses of absorbing Oxygen, and of changing thereby into an insoluble red matter, Cincho-fulvic acid. It precipitates Iron of a green colour.

Cincho-fulvic acid, called also Red Cinchonic′, or Cinchona red, is nearly insoluble in cold water, but slightly soluble in alcohol and ether. Its solutions precipitate Tartar Emetic, but not Gelatine. It gives the colour to most barks, and is soluble in alkalis, forming an intensely red solution. It has the composition $C_{12}\,H_7\,O_7$.

Kinovic acid $(C_{12}\,H_9\,O_3)$ was first discovered in *Cinchona nova*. It was supposed by Batka to be contained only in those false Cinchonas which are yielded by the genus *Buena*. But Schwartz and Winckler have found it in the genuine Cinchonas. It something resembles Stearic acid, being, like the last acid, insoluble in water. It is very soluble in alcohol and ether. Solutions of its alkaline salts precipitate Acetate of Lead and Bichloride of Mercury.

By long boiling in water, Cinchona bark is exhausted of its alkaloids, and of the Kinic and Cincho-tannic acids. If this exhausted bark be treated with liquid Ammonia, Cincho-fulvic and Kinovic acids are dissolved out of it. On the addition of Hydrochlor. acid they are both precipitated, and they may then be separated by boiling them with milk of lime, the Kinovate of Lime being soluble in water, the Cincho-fulvate insoluble. (Winckler.)

Besides the alkaloids and acids, Cinchona bark contains certain

other vegetable principles. A thick *Volatile Oil* with an acrid taste and the peculiar odour of the bark, has been obtained from it. Also a concrete *Fat*, capable of forming soaps with alkalis. *Salts of Lime* have been found in the greatest quantity in those barks which yield most Quina, as the Calisaya bark. *Gum* has been observed to abound most in those which yield most Cinchonia, as the Pale barks, and to be deficient in the Yellow and Red barks, whence it has been inferred that the latter are produced by the older parts of their respective trees. *Resin* and *Starch* are contained in various proportions. The bulky residue of the bark consists of *ligneous fibre.*

Cinchonometry.

Under this term are included those means which have been adopted of determining with accuracy the exact proportion of the active principles in a given specimen of Cinchona bark, a determination which is not easy, but which is important alike to the physician and to the pharmaceutical chemist. There are several rough methods of Cinchonometry. It is known to English manufacturers of Quinine that those barks which yield most of this alkaloid, as the Calisaya bark, contain so much *Lime* that a strong infusion will yield a precipitate with a solution of Sulphate of Soda. This is therefore adopted as a simple and efficient test of their quality. Again, it is generally found that the best Cinchona barks contain a considerable quantity of *Tannic acid* (or Cincho-tannic), an astringent ingredient which further heightens their remedial efficacy. In this way the tests for this acid become to a great extent tests of the quality of a specimen of bark. By a law in Sweden every bark imported is tested by a solution of Gelatine, and one of Tartar Emetic. A third and more direct mode of ascertaining the value of a bark consists in the use of an infusion of galls, the tannic acid in which causes precipitates of *the alkaloids* from a strong decoction.

By the appearance of this precipitate their amount may be roughly ascertained. But by this test no note is taken of any part of these alkaloids which may exist in the bark in an insoluble form, not in combination with Kinic acid. A fourth test, which also takes no notice of this insoluble part (existing as Cincho-tannate, Kinovate, and Cincho-fulvate of Quina or Cinchonia), is to precipitate a decoction of 100 gr. in f℥ij. of water with f℥j. of a concentrated solution of Carb. Soda. By this mode, according to the E. C., 2 gr. of Quina should be obtained from good yellow bark.

There are two chief ways in which a more or less exact quantitative estimate may be made of the amount of alkaloids in a specimen of bark.

1. *Precipitation Method.* Dr. Buchner obtains the alkaloids, slightly coloured and impure, by simply exhausting the bark by boiling in dilute Sulph. acid, then concentrating the liquid as much as possible, and precipitating by Ammonia in excess. By this means 2·187 grs. were obtained from 100 grs. of Calisaya. Perhaps a still better way

is to commence by extracting all the acids from the bark by the use of Carb. Soda, as in the E. formula for the preparation of Disulph. of Quina. When Quina and Cinchonia are obtained mixed they may be separated by means of ether, which dissolves away the former.

2. *Chloroform Method.* This is the invention of M. Rabourdin, and seems to have yielded very accurate results. ℥v. of Yellow or Red bark, or a larger quantity of Grey bark, are exhausted by percolation in a displacement apparatus with dilute Hydrochloric acid (f℥v. in Aq. Oiiß.). The solution is then shaken up with ℥iß. of Caustic Potash and f℥v. of pure Chloroform. The alkaloids being set free from the acid by the Potash, are dissolved out of the watery solution by the Chloroform, which has a great affinity for them. The Chloroform forms a floating stratum below a red liquid. It must be carefully separated, and the alkaloids obtained by evaporation. Quina and Cinchonia may then be separated by means of ether, or by solution in a small quantity of boiling alcohol, out of which the Cinchonia will crystallize on cooling.

In Christison's Dispensatory is given a table of the amount of the alkaloids in different kinds of bark according to some early investigators; but not only were the results of these chemists (Soubeiran, Von Santen, &c.) very discrepant, but they probably all underrated the quantity obtainable in most cases. It may therefore be useful to subjoin a table which has been compiled from the recorded experiments of Dr. Riegel of Carlsruhe, who has made trial of both of the above methods, finding them yield very similar results, but that of Rabourdin rather the most accurate. It represents the amount obtained from 100 grains of each kind of Cinchona bark.

Barks.	Quina.	Cinchonia.	Quinidia.
Best Calisaya	3·8	..	..
Calisaya Josephiana . . .	3·29	..	..
Middling Calisaya . . .	2·5	..	..
Cinchona pubescens . . .	1·7	..	..
Fibrous Carthagena . . .	..	1·04	1·04
Hard Carthagena . . .	1·04	1·35	..
Best Red bark	2·65	1·51	..
Large Red bark	2·50	1·35	..
False Red bark (?) . . .	·52	·73	..
China Regia rubiginosa (?) . .	..	2·87	..
Heavy Huanuco	..	2·4	..
Thick-quilled Huanuco . .	..	1·87	..
Finest Crown Loxa . . .	·52	·42	..
Ordinary Loxa	..	·73	..
Huamalies bark	..	1·46	..
Thick Huamalies . . .	..	·93	..
Jaen China bark	..	·61	..
China Nova Surinamensis . .	..	..	..

Cusco bark contains Aricina (?) 1·15 per cent.

This table accords for the most part with the results of other recent observers. The analyses of Mr. Howard, also a most careful chemist, have already been frequently referred to.

Preparations of the Cinchona Barks.

Various preparations of the Cinchona barks are employed in medicine, and have this advantage over the pure active principles, that they are cheaper and easier of preparation. In addition to the alkaloids they contain more or less of the astringent acids of the bark. They therefore add an astringent property to the tonic power of the others. But these advantages are more than counterbalanced by the bulky nature of these preparations, which often renders them irritant to weak stomachs, and by their uncertainty in strength, which depends not only upon the very variable quality of the barks employed, but also upon their active principles being considerably more soluble in some menstrua than in others.

Infusum Cinchonæ, L. E. Infusion of Cinchona.

Prep. L. Macerate *bruised Calisaya bark* ℥j. in *Boiling dist. water* Oj. for 2 hours in a covered vessel, and strain.
E. Similar: but any bark may be used, according to prescription.

Infusum Cinchonæ pallidæ, L. Inf. Cinchonæ, D. Infusion of Pale Cinchona.

Prep. L. Same as above, Loxa bark being used. D. Twice as strong.

Action. Uses. In these infusions the Kinates of the alkaloids and most of the Cincho-tannin are dissolved by the water, but that part of the active principles which is not in combination with Kinic acid being insoluble, such a preparation is necessarily weak. Either of the infusions forms a good light tonic in delicate states of the stomach, and may be taken in doses of f℥j.—iij. every 4 hours.

Infusum Cinchonæ spissatum, L. Concentrated infusion of Cinchona.

Prep. Macerate *coarsely bruised Calisaya bark* ℔iij. in *Aq. dest.* Ovj., as in the preparation of Extract of Cinchona, and strain. Evaporate the mixed infusions in a water-bath to one fourth, and set aside that the dregs may be deposited. Pour off the clear liquor, and strain the rest. Mix, and again evaporate, until the sp. gr. of the liquid be 1·200. When cool, drop in *Rect. Spirit* by degrees, f℥iij. to each ℥j. of the liquor. Lastly, set aside for 20 days, that the dregs may entirely subside.

Infusum Cinchonæ Pallidæ spissatum, L. Concentrated infusion of Pale Cinchona.

Prep. Same as above, Loxa bark being used.

Action. Uses. These concentrated infusions were introduced in the P. L. of 1851. They are intended as substitutes for the various

liquids prepared and sold by different druggists under the names *Liquor Cinchonæ* and *Liq. Cinch. Pallidæ.* They are more convenient for prescription than the ordinary infusions, and may be kept for any time on account of the spirit which is added to them.

D. f ʒß.—iv.

DECOCTUM CINCHONÆ, L. E. Decoction of Cinchona.

Prep. L. Boil *bruised Yellow* or *Calisaya bark* ʒx. in *Dist. water* Oj. for 10 minutes in a covered vessel, and strain while hot. E. Similar: but with any bark.

DECOCTUM CINCHONÆ PALLIDÆ, L. Dec. Cinchonæ, D. Decoction of Pale Cinchona.

Prep. L. Same as above, Loxa bark being used. D. Similar.

DECOCTUM CINCHONÆ RUBRÆ, L. Decoction of Red Cinchona.

Prep. Same as above, Red bark being used.

Action. Uses. By the continued action of boiling water, much of the active principle is extracted, but it is also deposited on cooling, in consequence of the Cincho-fulvic acid uniting with the alkaloids, and forming compounds insoluble in cold water.* Both the Infusions and Decoctions would be much improved by being made with Acidulated water, which would retain the alkaloids in solution. These decoctions may be employed for the same purposes, and in the same doses, as the infusions.

TINCTURA CINCHONÆ, L. E. Tincture of Cinchona.

Prep. L. Take bruised *Yellow Bark* ℥viij., *Proof Spirit* Oij. Macerate for 7 days, and strain.

E. Similar: any bark being used, as desired; or else, more expeditiously, and with less loss, prepare by percolation. (Proportions same as L. The bark, being in fine powder, is first moistened with a little spirit, left thus for 10 or 12 hours, and then firmly packed in the cylinder.)

TINCTURA CINCHONÆ PALLIDÆ, L. Tinct. Cinchonæ, D. Tincture of Pale Cinchona.

Prep. L. Same as last, Loxa bark being used. D. Similar.

Action. Uses. Either of these may be prescribed as a Tonic with the Infusion or Decoction in doses of f ʒj.—f ʒiij. Proof Spirit being a good solvent of the active principles of the Cinchonas, especially if acting by percolation, an excellent Extract is yielded on distilling off the Spirit.

TINCTURA CINCHONÆ COMPOSITA, L. E. D. Compound Tincture of Cinchona.

Prep. L. Macerate for 7 days *bruised Pale bark* ℥iv., *dried Orange-peel* ℥iij., powdered root of *Aristolochia Serpentaria* ʒvj., chopped *Saffron* ʒij., bruised *Cochineal* ʒj., in *Proof Spirit* Oij. Strain.

* Schlottfeldt has obtained pure Quina in considerable quantities from the residue of Cinchona bark, which had been employed to make the decoction.

E. D. Similar: the E. C. ordering Yellow bark, the D. Brown or Pale. The E. C. also states that it may be made by percolation, the bark being in fine powder, in the same way as Comp. Tinct. Cardamom.

Action. Uses. A stimulant Tonic; more agreeable from the presence of the stimulants; sometimes called Huxham's Tincture of Bark. Used as the above in doses of f3j.—f3iv.

Prof. Donovan has (Pharm. Journ. iv. 125) recommended a Syrup of Cinchona, of which the active ingredients are Dikinate of Quina, with the natural Cincho-tannin of the bark. It seems to be an efficient and pleasant preparation.

Extractum Cinchonæ, L. E. Extract of Cinchona.

Prep. L. Add *Aq. dest.* Oiv. to *coarsely bruised Yellow bark* ℔iij., and stir constantly with a spatula till the mass is moistened throughout; macerate for 24 hours, and strain through linen. Macerate what remains again in *Aq.* Oij. for 24 hours, and strain, then evaporate the mixed liquors to a proper consistence. The E. C. prepares this Ext. by percolation with *Proof Spirit,* with any bark, as prescribed.

Extractum Cinchonæ pallidæ, L. Extract of Pale Cinchona.

Prep. Same as above, Loxa bark being used.

Extractum Cinchonæ rubræ, L. Extract of Red Cinchona.

Prep. Same as above, Red bark being used.

Action. Uses. The watery extracts are convenient for exhibition in pills in doses of gr. v.—3ß. They are best prepared in vacuo; but in efficiency are inferior to the Spirituous extracts in the same doses.

Pharm. Prep. Vinum Gentianæ, E. Mistura Ferri aromatica, D.

Incompatibles with Cinchona Preparations. Ammonia, Potash, their Carbonates, Lime-water, Arsenite of Potash, Tartar Emetic, Persalts of Iron, Acetates of Lead, Bichloride of Mercury, Nitrate of Silver, Tincture or Infusion of Galls, Solutions containing Tannic acid, and Gelatine.

Preparations of the Cinchona Alkaloids.

These alkaloids supply us with the active parts of the Cinchona barks in a pure, elegant, and concentrated state. They have the advantage over those barks of greater power and of uniformity of strength. On these grounds they are generally preferred to the barks, though the latter contain in addition to them some astringent principles and a volatile oil.

Quinæ Disulphas, L. Quinæ Sulphas, E. D. Disulphate or Sulphate of Quina, commonly called Sulphate of Quinine. A Crystalline salt prepared from Yellow Cinchona, L.

This salt ($2\,C_{20}\,H_{12}\,N\,O_2+S\,O_3+8$ Aq.) has now almost entirely superseded all the other preparations of Cinchona, and is that commonly spoken of as Quinine. As Quina exists in bark combined with Kinic acid, it is first detached from this, and then made to unite

with Sulphuric'. This is effected by various processes. In these Yellow bark is generally employed, as richest in Quina, and as containing it less mixed with the other alkalis. The bark is first exhausted of its bitterness by repeated maceration in water acidulated with Sul' or with H Cl, then some more powerful base is presented to the acid, which precipitates the Quina. This is finally purified and combined with Sul'.

Prep. No formula is now given by the L. C. The following process is the one most usually adopted by the manufacturers, and which has now been imitated by the D. C. Coarsely bruised Yellow bark is boiled with water, acidulated with $S O_3$ or H Cl. The residue is again boiled with acid and water, a second, a third, or even a fourth time. The decoctions are mixed and filtered; and when they are cool, finely powdered slaked lime is added until the liquid becomes alkaline and dark in colour. The precipitate is collected, drained, and submitted gradually to forcible pressure. The cake thus obtained, when dry, is reduced to powder, and digested in Rectified Spirit. The filtered tincture is distilled until the residue (impure Quina) has a brown viscid appearance. This is then carefully saturated with very dilute Sulphuric acid, the solution filtered, and set aside to crystallize. The yellowish Disulphate thus obtained is drained in a cloth, compressed, again dissolved in water, decolorized with Anim. Charcoal, and recrystallized. Finally, it is dried with great care, so as to avoid efflorescence. (By the acid used, all the Quina is extracted from the bark in the form of a soluble Sulphate or Hydrochlorate, along with the Kinic acid and other sol. matters. By the addition of Lime a soluble Kinate of this base is formed, along with a soluble Chloride of Calcium or insoluble Sulph. Lime. The Quina, being set free, is precipitated, and separated from most impurities, as from Sulph. Lime if $S O_3$ has been used, by solution in Rect. Spirit. Finally, by the crystallizations and the use of Anim. Charcoal, the colouring and resinous matters, &c., are got rid of.) In the P. L. of 1836, Sulph. acid was first used; this was separated from the solution by moist Oxide of Lead added nearly to saturation; and the Quina was then precipitated by Ammonia. No spirit was employed.

E. Boil *Yellow bark* in coarse powder ℔j. for one hour in *Water* Oiv., in which *Carbonate of Soda* ℥iv. has already been dissolved. Strain and express strongly through linen or calico; moisten the residuum with water and express again; repeat this twice. (The insoluble acids, Cincho-tannic, Cincho-fulvic, and Kinovic, and the Kinic acid, are removed by the boiling alkaline solution.) Boil the residuum for half an hour in *Aq.* Oiv. acidulated with *Sul'* ʒij., strain, express strongly, moisten with Aq. and express again. Repeat the process twice with Aq. and Sul' ʒij. in divided portions. (The residual Quina with some Cinchonia is all removed by combining with the Sulph'.) Concentrate the whole acid liquors to about a pint; when cool filter and add *Carbonate of Soda* ℥iv. (Sulphate of Soda is formed and remains in solution, impure Quina being precipitated.) Collect the impure Quina on a cloth, wash it slightly, and squeeze out the liquor with the hand. Break down the moist precipitate in *Aq. dest.* Oj., add of Sul' nearly f℈j., heat to 212°, and stir occasionally. (Sulphate of Quina is formed.) If necessary add a little more Sul', Carb. of Soda, and Aq. dest. Filter. Evaporate and crystallize, repeat the process with Animal Charcoal, and pure crystals will be obtained if the details are minutely followed (*c*).

D. Macerate *powdered Yellow bark* ℔j. for 24 hours in *Water* Cß., acidulated with *Commercial Sulph. acid* fʒij., then boil for half an hour, and decant. Boil the residue with another Cß. of *Water* and fʒj. of *Sulph. acid*, and again decant. Do the same a third time with an equal quantity. Evap. the mixed liq. to Oij., filter cold through calico, and to this solution add *Slaked Lime* ℥j., or until it becomes decidedly alkaline. Wash the precip., collected on a calico filter, with Oj. of cold water. When partially dried on porous bricks, envelope in blotting paper, and subject it to powerful pressure. This is then boiled with Oj. of

Spirit, and again a second, and a third time, with two more pints. The Spirit is recovered by distillation, and the Quina dissolved in Sulph. acid, decolorized, and crystallized, as stated above. (This formula is imitated from the usual manufacturing process.) The use of spirit in this preparation is said not to add more than one penny an ounce to the cost of production.

Disulphate of Quina, or Sulphate of Quina, as it is considered by some chemists, is usually seen as a light flocculent mass of white, silky, slightly flexible, needle-shaped crystals, interlaced with each other, and grouped in small star-like tufts. They are without odour, but the taste is intensely bitter. Exposed to the air, the crystals effloresce, losing 6 parts out of their 8 equivalents of water of crystallization. At 212° they become luminous, especially if rubbed: at 240° they melt, losing two more equivalents of water, then become red, and at last ignite and burn away, leaving no residuum. According to Baup, they require 740 parts of cold and about 30 parts of boiling water for solution, giving a bluish tinge to the water. They require only 60 parts of Rectified Spirit at ordinary temperatures, and are very soluble in diluted acids, especially Dil. Sul′. This salt is composed of 2 Eq. Quina+1 Eq. Sul′+8 Aq.=436.

Disulphate of Quina, on account of its high price, is apt to be adulterated with the analogous salts of Cinchonia and Quinidia, as also with other bitter alkaloids, or even with crystalline fatty matters, Sulphate of Lime, Sugar and Starch, &c. The following tests of purity are given by the L. C. "It is dissolved by water, especially when this is mixed with an acid. Ammonia being added to the solution, Quina is precipitated; the liquid, being then evaporated, should not taste of sugar. From 100 grs. of Disulph. Quina 8 to 10 grs. of water are expelled by a gentle heat. It is destroyed by heat. Freshly prepared Chlorine being first added to it, and then Ammonia, it turns green. From 100 grs. dissolved in water and hydrochloric acid, on adding Chloride of Barium, 26·6 gr. of Sulph. Baryta, dried at a red heat, are obtained." The E. C. adds a quantitative test for the Quina, which, however, will not detect adulteration by another alkaloid. "A solution of gr. x. in Aq. dest. f℥j. and acid, Sulph. iij. ij.—iij., if decomposed by a solution of Carb. Soda ʒiv. in 2 waters, and heated until the precipitate shrinks and fuses, will yield on cooling a solid mass, which, when dry, weighs 7·4 grs., and in powder dissolve entirely in solution of Oxalic acid."

This salt being one, the exact purity of which, on account of its expense and remedial value, it is of importance to ascertain, it may be useful to arrange the adulterations to which it is liable under 8 heads, stating successively the means for their detection.

1. *Disulphate of Cinchonia* is much cheaper than the same salt of Quina. Though it forms large crystals, it may be made to crystallize in a fine pulverulent form, by stirring a strong solution while cooling. In the process for preparing Quinine, the salt of Cinchonia remains in the mother liquor on account of its greater solubility. But as it is often found in Yellow bark, it may fairly exist in

the commercial salt to the extent of 1½ or 2 per cent. When in larger quantities, Red or Pale bark has probably been employed, or adulteration purposely practised. In this case its presence may be detected by shaking a little of the salt with a large quantity of Lime-water, when the Quina is dissolved, but the Cinchonia left. Or the mixed alkaloids may be separated from the solution by Ammonia, then boiled in a small quantity of alcohol, out of which the Cinchonia alone will crystallize on cooling. A third and more exact process is that of Liebig, which depends upon the fact that Quina is soluble in ether, but Cinchonia almost insoluble. The solution of the Disulphates is precipitated by excess of Ammonia, and the liquid then shaken up with a considerable quantity of ether. The latter soon separates on the surface of the water, holding the Quina in solution. Being carefully removed, and evaporated, it yields the Quina. The loss is Cinchonia.

2. *Disulphate of Quinidia* resembles in appearance the same salt of Quina. In consequence of a late decree of the Bolivian government, which has closed the Calisaya forests for a term of years, and thereby increased the price of the genuine Yellow bark, the manufacturers of Quinine have been driven to resort to the cheaper barks of Peru and New Granada. Some of these, and more particularly the *fibrous Carthagena bark*, yield as much Quinidia as Quina (*v.* p. 507), whence it follows that this alkaloid has been lately found in large quantities in the commercial Disulphate of Quina. Its presence may be detected in two ways; by the Disulphate being more sol. in boiling Aq. than the officinal Quinine; and by the alkaloid Quinidia being less sol. in ether than Quina. Mr. Howard states that 100 grains of Disulph. Quina are perfectly sol. in 7 oz. of boiling dist. water, but that the same quantity will take up 800 gr. of Disulph. Quinidia. Whence the following is a good rough test. Boil 100 gr. of Quinine (ascertained to be free from sugar, &c.) with 5 oz. of dist. water, and if it is wholly dissolved, it probably contains Quinidia. The solubility of the alkaloids in ether may thus be compared:—10 gr. of pure Quinine, added first to 20 drops of Liq. Ammoniæ (which sets free the alkaloid), are then completely dissolved by 60 drops of ether. Only 1 gr. of Disulph. Quinidia is sol. in the same quantity of ammonia and ether. This degree of solubility will form a second test of purity. When it is desirable to ascertain the precise quantity of Quinidia present, this may be done in either of two ways. The mixed alkaloids may be separated by Ammonia, then dissolved in alcohol or ether, and, this being allowed to evaporate spontaneously, the Quinidia alone will crystallize out in large clear prisms. A shorter method is that proposed by Zimmer; the mixed alkaloids are digested in ether which has already been saturated with Quinidia, and it is said that by this means the Quina alone is dissolved out.

The other impurities of officinal Quinine are more easily detected than the above.

3. *Sulphate of Lime.* This will be left as a fixed residue, insoluble in water and alcohol, when a small quantity of the salt is ignited. Seldom found.

4. *Stearic or other fatty acids.* If such an impurity be present, an oily pellicle will float on the surface of the solution when the salt is dissolved in boiling water. Seldom present.

5. *Soluble organic matters,* as gum, sugar, starch, mannite, sugar of milk, These are dissolved by boiling water. The salt will blacken with strong Sulphuric acid. And when the Quina has been separated by Ammonia, these impurities will be found by evaporation of the solution.

6. *Salicine,* a bitter crystalline principle obtained from willow and elm barks, has sometimes been present in considerable quantities. The impure salt will turn red on the addition of strong Sulphuric acid. Heated with Sulph. acid and Bichromate of Potash, it will evolve the odour of Meadow-sweet.

7. *Phloridzine,* a similar principle found in the root-barks of the Apple and Cherry, has been detected as an adulteration in some recent instances. If a few drops of Nitric acid are added to a small portion of the Quinine which contains it, it becomes first yellow, then green, and finally dark brown. (P. J. xi. 138.)

8. *Ammoniacal salts,* as the Hydrochlorate, may be detected by the evolution of Ammonia, when the solution is heated with Potash.

Tinctura Quinæ Composita, L. Compound Tincture of Quina.

Prep. Digest *Disulph. Quina* ℥v. and ℈j. in *Tincture of Orange-peel* Oij. for 7 days, or until it is dissolved. Strain.

This was introduced in the last P. L., and is likely to prove valuable as an elegant tonic and aromatic combination. It has been affirmed by many that the Quinine is not soluble to the extent ordered, and that it must be precipitated by the Tannic acid which certainly exists in the tincture. But Mr. Hemingway has found that if the directions are followed, the whole is dissolved with the exception of a very trifling precipitate. It seems that this solvent power is partly owing to a slight acidity of the Tinct. Aurantii, supposed to depend either upon a natural vegetable acid in the peel, or to its having been wet with the orange-juice before cutting (P. J. xi. 68).

D. f ʒi.—iij. Each fʒi. contains 1 gr. of Quinine.

Quinæ Sulphas. As the officinal disulphate is generally prescribed along with a small quantity of Dil. Sulph. acid (♏j. to gr. j.) to render it sufficiently soluble in water, the neutral sulphate is in fact the compound which is commonly given. This salt is soluble in 10 parts of water at 60°. By evaporating its solution rhombic crystals are obtained.

Quinæ Murias, D. The Muriate of Quina is formed by the D. C. by mixing a hot solution of Disulph. Quina ℥j. with a solution of gr. 123 of Chloride of Barium. Sulph. Baryta falls, and is separated by filtration. The Muriate of Quina crystallizes when the solution is evaporated. In properties and uses it resembles Disulph. Quina, but it is much more soluble in water.

Quinæ Valerianas, D. Valerianate of Quina.

Prep. Dissolve *Valerianate of Soda*, gr. 124, in *Aq. dest.* f℥ij., and *Muriate of Quina* ʒvij. in *Aq. dest.* f℥xiv. Raise the temperature of each solution, but no higher than 120°, then mix them, and set aside for 24 hours, after which the Valerianate of Quina will have become a mass of acicular crystals. Press between folds of blotting paper, and dry without heat. (Chloride of Sodium is formed at the same time.)

This salt is in very small needle-shaped crystals, having an odour of Valerian, and entirely destroyed by a red heat. It is soluble in hot, but nearly insol. in cold water. The solution gives a precip. with Nitrate of Barytes, which is entirely dissolved by Nit. acid, unless the salt contain Disulph. Quina.

Action. Uses. Valerianate of Quina has been much extolled as an Antispasmodic tonic in convulsive diseases, being thought to combine the properties of its component parts. It has also been used as an Antiperiodic.

D. gr. j.—iij.

Quinæ Arsenis. Arsenite of Quina has been lately much employed, especially abroad, as a remedy for cutaneous diseases. It may

be made by a double decomposition between Disulph. Quina and Arsenite of Potash, but M. Soubeiran recommends the following formula as much better :—

Prep. Dissolve *Disulph. Quina,* 100 parts, in *Aq. dest.* acidulated with *Sulph. acid.* Precipitate the Quina with *Ammonia,* wash it, press in bibulous paper, and dissolve it in *Rect. Spirit,* 600 parts. Add *Arsenious acid,* 14·4 parts, heat them together, and filter. As the liquid cools, the Arsenite of Quina separates in acicular crystals.

Ferri et Quinæ Citras. This elegant double salt, though not officinal, is in frequent use. Mr. Redwood gives the following formula for its preparation.

Prep. Dissolve *cryst. Citric acid,* 6 parts, in 20 times its weight of water; add *clean iron filings,* or *small nails,* 3 parts, and dissolve with a gentle heat, renewing the water as it evaporates; add *recently precipitated Quina,* 1 part, and continue the heat for some minutes. Filter, evaporate to a syrupy consistence, spread out on earthenware dishes, and dry with a gentle heat.

It separates in translucent yellowish-brown scales, which are very soluble in water, and probably consist of a salt analogous in composition with the Ammonio-citrate of Iron, the Quina replacing the Ammonia. It combines the tonic properties of Iron and Quinine, and may be given in doses of gr. ij.—gr. v., or more, 3 times a-day.

Cinchoniæ Disulphas. The Disulphate of Cinchonia is prepared in the same way from Pale Bark as the Disulph. Quina from Yellow Bark. It resembles the latter in composition. Red Bark contains the 2 alkaloids in about equal proportions, and will therefore yield both of these salts. The salt of Cinchonia is much more soluble than that of Quina, being dissolved by 54 parts of cold water, and 6 of alcohol. It crystallizes in short oblique prisms. It is considered by Pereira and others to be equal in medicinal activity to the Disulph. Quina. It may be given in the same doses to produce the same effects, and will form a valuable substitute in the case of a failure of Yellow Bark. There is, however, a strong prejudice among medical men in favour of the Quina salts.

Quinidiæ Disulphas. The Disulphate of Quinidia has been already mentioned as a frequent ingredient in commercial Quinine, and it remarkably resembles the officinal salt in appearance, as well as in composition. According to the experiments of Bauduin, this salt also is similar in medicinal quality and exactly equal in efficiency to the Disulph. Quina. It may, therefore, be given as a substitute for the other in the same doses. But, however similar as medicines this and the preceding salt may be to the Disulph. Quina, they are certainly cheaper in the market, and they cannot therefore be mixed with it, or substituted for it by the makers, without dishonesty.

Action and Uses of the Cinchona Barks and Quina. The Cinchona barks are slightly Astringent, eminently Tonic and Antiperiodic;

hence they are frequently prescribed to strengthen, in diseases of debility or in convalescence from acute diseases, but especially for arresting the accession of Intermittent and Remittent Fevers, and attacks of Periodic Neuralgia and of Rheumatism; either in the form of Powder, in doses of gr. x.—gr. xxx., in Infusion, Decoction, Extract, or Tincture: sometimes all three are united in one of the watery preparations. But as the properties depend chiefly on the alkalis, though partly also on the astringent principle, the former, especially in the form of the Disulphate of Quina, have nearly superseded all the other preparations. The similar preparation of Cinchonia may no doubt be, and is, used for many of the same purposes. The Disulphate of Quina, often converted to a Sulphate by a few drops of Sul′, is prescribed in doses of gr. j.—gr. v.; but scruple doses have been given in obstinate periodic attacks of Neuralgic pain or of Ague.

GAMBIR. The *Uncaria Gambir*, a plant of the order Cinchonaceæ, and a native of Malacca and the Indian Archipelago, yields a kind of Catechu, to which reference has already been made (*v.* p. 396). It differs from the common Catechu, which it resembles in its general characters and astringent properties, in being an *extract of the leaf*, not of the wood of the plant. Gambir is of a porous but hard consistence, reddish-brown in colour, and prepared in small cubes. M. Berthold Seeman states that the plant is very extensively cultivated by the Chinese at Singapore, and is grown along with pepper in the same plantations. He states that the leaves are boiled in water until their astringency is all extracted, that this decoction is then inspissated, and cut into square pieces to dry.

VALERIANEÆ, Dec. Valerianads.

The perennial plants of this order secrete a volatile oil of a strong odour, and possessed of stimulant properties. They inhabit temperate climates.

VALERIANA, L. E. D. Valeriana officinalis, Linn. Herbæ sylvestris radix. The Root of Wild Valerian. *Triandria Monogynia*, Linn.

Some of the Valerians have been used in medicine from the earliest times. Dioscorides describes three kinds of Nard or Valerian besides the φου. The Spikenard of the ancients, *Nardostachys Jatamansi* (Him. Bot. t. 54°), a produce of the Himalayas, is still highly esteemed in the East. *Valeriana celtica* and *Saliunca* are even imported by the Red Sea from Austria for perfuming their baths. (*v.* Illustr. Himal. Bot. p. 242.) *V. Dioscoridis* is supposed to be the φου of that author, and the officinal or wild Valerian was no doubt early introduced as a substitute for it.

Root perennial, tuberous. Stem 2 to 4 feet high, smooth, furrowed. Leaves all pinnate, or pinnately cut; leaflets lanceolate-dentate, in 7 to 10 pairs, terminal one very little, if at all, larger than the others. Inflorescence a corymb, becoming at length somewhat panicled. Bracts ovate-lanceolate. Calyx-limb

involute during flowering, then unrolled into a deciduous pappus, consisting of many plumose setæ. Corolla roseate; tube funnel-shaped, gibbous at the base; limb 5-lobed. Stamens 3. Fruit smooth, compressed, 1-celled, 1-seeded, crowned by the limb of the calyx expanded into a feathery pappus.—Ditches and damp places throughout Europe.—E. B. 698. Esenb. and Eberm. t. 254.

The tuberous root-stock with its numerous radicles is the officinal part; that which grows in dry pastures is more fragrant, and that of the wild more so than that of the cultivated plant, whence the former is directed to be used in the L. P. It has a bitter acrid taste, and a powerful penetrating odour, which is considered disagreeable by most people. It consists of Volatile Oil about 1 per cent, Resin 6, Resinous Extractive 12·5, Extractive 9·4, and of Woody Fibre 71 per cent, (*Trommsdorff.*) The Oil, upon which the properties of Valerian depend, is of a greenish colour, has a strong penetrating odour, and a camphoraceous, aromatic taste. When fresh, it contains an Oily principle, *Valerole*, which is crystallizable, and some passes into Valerianic acid by being oxygenated in the air. It also contains a Hydro-Carbon, *Bornéene* ($C_{10}H_8$), identical with the Oil obtained from Borneo Camphor; and finally, a Camphor which is identical with the Borneo Camphor. (*Gerhardt.*) When the root is distilled with water, there comes over with the Oil an acid fatty matter, *Valerianic acid.* This is an oily fluid, with a disagreeable smell; Sp. Gr. 0·944, boiling at 270°. It forms soluble salts of a sweet taste with bases. This acid may be produced by the oxidation of the Hydrated Oxide of Amyle, or Oil of Potato Spirit. (*v.* p. 112.)

It is used to make the Valerianates, which are officinal in the D. P. The Messrs. Smith, of Edinburgh, have published a good formula for preparing it from the root. They boil this with a solution of Carb. Soda, which extracts the acid; then adding Sulph. acid to the liquid, they distil off the free Valerianic acid.

The active properties of Valerian Root may be extracted by alkalized water, Spirit, or Ammoniated Spirit.

Action. Uses. Diffusible Stimulant and Antispasmodic. The Volatile Oil is recommended by many. The Valerianates of Zinc, Iron, and Quina, have been employed of late as Antispasmodic Tonics.

D. Of the powdered root, gr. xx.—gr. xl. Of the Volatile Oil, ♏iij.—♏v.

INFUSUM VALERIANÆ, L. D. Infusion of Valerian.

Prep. L. Macerate for half an hour *Valerian root* ℥ß. in *boiling dist. water* Oj. in a closed vessel, and strain. D. Similar.

Action. Uses. Moderate Stimulant, in doses of f℥j.—f℥ij.

TINCTURA VALERIANÆ, L. E. D. Tincture of Valerian.

Prep. L. D. Take bruised *Valerian root* ℥v., *Proof Spirit* Oij. Macerate for 7 days. Press and strain.

E. Proceed by percolation or digestion, as for Tinct. Cinchonæ.

Action. Uses. Stimulant adjunct to draughts in doses of f℥ß to f℥iv.

Tinctura Valerianæ composita, L. Tinct. Val. Ammoniata, E. Compound Tincture of Valerian.

Prep. L. Take *Valerian root* bruised ℥v., *Aromatic Spirit of Ammonia* Oij. Macerate for 7 days, and strain.
E. Proceed by percolation, as directed for Tinct. Cinch.

Action. Uses. Antispasmodic, and more Stimulant from the presence of Ammonia, may be given in doses of f℥ß.—f℥ij.

Compositæ, *Adans.*

Synanthereæ, *Auct.* Asteraceæ, *Lindley.* Composites.

Sub-Ord. I. Cynarocephalæ.

Florets hermaphrodite, all tubular, with 5, or rarely 4, equal teeth, with a convex or hemispherical top. Stigma jointed to the style.—Several of these are bitter, as *Centaurea Centaurium;* a few are a little odorous, as *Centaurea moschata.* The Safflower, *Carthamus tinctorius*, is valued on account of the colouring matter procurable from its florets.

The leaves of the *Cnicus benedictus*, or Blessed Thistle, a native of the south of Europe, and of Asia, and the root and seeds of the *Arctium minus*, or Lesser Burdock, a common indigenous plant,—both contain bitter principles, were long in popular use as alterative tonics, and were lately retained in the D. P., but are now no longer officinal.

Sub-Ord. II. Corymbiferæ.

Florets of the disk all tubular, forming a level top; marginal florets often ligulate. Stigma not joined to the style.

The decoction, infusion, and some other preparations, of the leaves and flowers of the common *Tussilago Farfara*, or Coltsfoot, are frequently employed as demulcent in coughs. This plant was the *βήχιον* of the Greeks. It is mucilaginous and slightly bitter.

Inula, L. Inula Helenium, *Linn.* Radix. Root of Elecampane.

Elecampane has been prescribed since the time of Hippocrates.

Root perennial, thick, elongated, brownish externally, white in the inside. Stem erect, 3—4 feet high, round, leafy. Leaves large, cordate-ovate, acute, stem-clasping, unequally toothed, downy beneath; radical leaves petioled, ovate-oblong. Flower-heads few together, or solitary, large, bright yellow. Involucre imbricated in many rows, outer scales ovate, inner obovate. Florets of the ray female, ligulate, 3-toothed, subtubular; those of the disk hermaphrodite, tubular, 5-toothed. Anthers with two bristles at the base. Receptacle flat, reticulated. Achænia quadrangular, smooth. Pappus uniform, in one row, composed of roughish setæ.—Moist pastures throughout Europe, flowers in July and August. St. and Ch. 49.

The root, when chewed, tastes first glutinous, then bitter and aromatic, and finally a little pungent. It is generally cut into slices, for

the convenience of drying and preserving. It contains Bitter Extractive 36·7, a peculiar kind of starch, which has been named *Inuline*, 36·7, *Helenine*, or a neutral crystalline principle in some respects resembling Camphor, 0·3, Wax 0·6, acrid Resin 1·7, Gum 4·5, with Lignine, Albumen, and salts of Potash, Lime, and Magnesia. *Inuline*, which has been found in many other roots, and has received different names, is a white amylaceous substance, something like common Starch, but differing in a part being precipitated on cooling from its boiling watery solution, in being rendered of a yellow colour by Iodine, and in being a little soluble in boiling Alcohol.

Action. Uses. Stimulant Tonic, Expectorant, and Diaphoretic; has been prescribed in Dyspepsia and in Chronic Catarrh.

D. Powder, ℈j—ʒj. Of the Decoc. or Inf. (℥ß. to Aq. Oj.) f℥iß.

Pharm. Prep. Conf. Piperis nigri, L. A constituent of many preparations on the Continent.

In the article Senna (p. 408) it was mentioned that a very good substitute for Senna is afforded by one of the Compositæ. This is BERTHELOTIA LANCEOLATA var. *indica*, Dec. (Prod. v. p. 376), of which the leaves, as ascertained by Dr. Falconer, are those called *ra* and *rae-Suna* by the natives of north-west India. They are mentioned in the author's Illustr. of Himal. Bot. p. 319, having been given to him as those of *Salvadora indica*, Royle, which they a good deal resemble, and are produced in the same arid tract of country extending from the banks of the Jumna towards central India. Dr. F. pronounces the leaves to be an excellent substitute for Senna, and to be remarkable for growing with their edges vertical, and for having both sides covered with stomata.

ANTHEMIS, L. E. D. Anthemis nobilis, *Linn.* Flos, L. Flowers, E. D. *Chamæmelum.* Chamomile or Camomile.

The name ἀνθέμις occurs first in Theophrastus, and that of χαμαίμηλον in Dioscorides. Anthemis Chia is supposed to be the plant of Dioscorides. Others have been substituted, as *Matricaria suaveolens* in India; *M. Chamomilla* was at one time distinguished as Common Chamomile, and the other called Noble or Roman Chamomile. The last is the present *Anthemis nobilis.*

Roots perennial, with long fibres. Stems in a wild state procumbent, when cultivated, erect, about a foot long, much branched, leafy, round, furrowed, hollow. Leaves doubly pinnate, leaflets linear, subulate, slightly downy. Flower-heads terminal, solitary, with a convex yellow disk. Rays composed of hermaphrodite, tubular, 5-toothed florets. Rays white, reflexed, or spreading, formed of female florets in one row. Receptacle conical (fig. 2) with membranous scales. Involucre imbricated in a few rows, scales obtuse, hyaline at the margin. Fruit obtusely tetragonal, smooth, crowned with an obsolete margin, without pappus.

Two varieties are known. *a.* Flore simplici, fig. 76. *b.* Flore pleno, Double Chamomile, in which the florets of the disk are converted into white ligulate florets. (*v.* fig. 76, 1.)—Indigenous in gravelly places, also in other parts of Europe. Flowers in July and August. Cultivated at Mitcham in Surrey.—E. B. 980. St. and Ch. 111. 38.*

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* Besides the above two kinds, a peculiar variety of Double Chamomile, which yields a blue oil, is cultivated at Mitcham. (P. J.)

The whole plant has a strong but pleasant odour, the taste being bitter with a little aroma. These properties are most conspicuous in the florets of the disk, which yield most Volatile Oil, and therefore the simple flowers are preferable to the double. The double flowers, however, on account of their showiness, are generally preferred by druggists. The active principles depend on the presence of a Volatile Oil, Bitter Extractive, and a little Tannin. Both water and Alcohol take up their active properties.

Action. Uses. Stimulant, Tonic, and Febrifuge.

Fig. 76.

INFUSUM ANTHEMIDIS, L. E. D. Infusion of Chamomile.

Prep. L. Macerate in a covered vessel for 10 minutes *Chamomile* ℥v. in boiling *Aq. dest.* Oj. Strain. E. D. Similar.

Action. Uses. Tonic.

D. f℥jß. The hot Infusion is sometimes employed to assist the action of emetics.

EXTRACTUM ANTHEMIDIS, E. Extract of Chamomile.

Prep. Boil *Chamomile* ℔j. in *Aq.* Cj. down to Oiv. While hot, filter, and in the vapour-bath evaporate to the due consistence.

Action. Uses. Simply Bitter, and Tonic, the stimulant Oil being dissipated during the evaporation. Given in doses of gr. x.—gr. xx.

OLEUM ANTHEMIDIS, L. E. D. *Anglicum*, L. Oil of Chamomile.

By distilling the Flowers with water a Volatile Oil is obtained, which is of a yellowish-brown colour, of a strong odour, and pungent taste. It is found chiefly in the disk.

According to Brande, the single flowers yield on the average 2 lbs. 12 oz. of the Oil for every 100 lbs. This Oil has been found by Gerhardt to consist of two parts, one a *liquid hydrocarbon*, the other a ternary oxidized compound, which strongly resembles, or is identical with, *Valerianic acid.*

Action. Uses. Tonic, Stimulant, and Antispasmodic. May be added to the Extract or to pills in doses of ♏j.—♏v.

PYRETHRUM, L. E. Anacyclus Pyrethrum, *Dec.* Radix, L. Root, E. Pellitory of Spain.

This root was known to Dioscorides (πυρέθρον), and is still employed in Eastern medicine under the name *akurkurha.* The plant is a native of the north of Africa, whence it has been introduced into the south of Europe. Hayne believes that the root is yielded by a nearly allied species, which he calls *A. officinarum*, ix. t. 46, and which he found cultivated in Thuringia.

Anacyclus Pyrethrum has a long fusiform root. Stems numerous, procumbent, branched, pubescent. Radical leaves spreading, petiolated, rather smooth, pinnatifid; the segments pinnated, with linear tubulate lobes; stem leaves sessile. Branches one-headed. Heads many-flowered. Involucre in few rows, short, somewhat cup-shaped, scales lanceolate, pointed, brown at the edges. Receptacle convex, with oblong, obovate, obtuse paleæ. Florets of the ray female, sterile, white above and purplish beneath; of the disk, yellow, tubular, with 5 callous teeth. All the corols with an obcompressed, 2-winged tube, without appendages. Style of the disk with exappendiculate branches. Achænium flat, obcompressed, bordered with broad entire wings. Pappus short, irregular, toothletted, somewhat continuous with the wings on the inner side. *Dec.*—Desf. Fl. Atl. ii. 287. Nees and Eberm. 244. St. and Ch. iii. 97.

The root, as described by Desfontaines, in its fresh state is fusiform and fleshy, about the thickness of the finger, brownish-coloured externally and white within. When handled in this state, it produces first a sensation of cold, soon followed by heat. It is without odour, but has an acrid pungent taste, and causes a copious flow of saliva. It is imported from the Levant. The French obtain it from Africa. It is cultivated also in Thuringia and at Magdebourg. The active part is soluble in Alcohol and Ether. It consists of 3 principles; an acrid fixed Resin, *Pyrethrine*, which is insoluble in Caustic Potash, another *Resin*, which is dissolved by that alkali, and a yellow *Acrid Oil*, also soluble in Potash. (Koene). The root also contains Inuline, Gum, a little Tannin, Colouring matter, various Salts, and Ligneous fibre.

Action. Uses. Irritant, Sialogogue. Sometimes used to relieve Toothache, or as a Masticatory in Palsy of the Tongue and relaxation of the Uvula.

ARTEMISIA, *Linn.*

Heads discoidal, homogamous, or heterogamous. Florets of the ray in one row, usually female and toothed, with a long bifid protruding style; of the disk 5-toothed, bisexual, or by the abortion of the ovary, sterile or male. Involucral scales imbricated, dry, scarious at the edge. Receptacle without paleæ, flattish or convex, naked or fringed with hairs. Achænia obovate, bald, with a minute epigynous disk. *Dec.*

The species of Artemisia extending from European to tropical countries, are most of them remarkable for their strong odour and bitter taste, and have been employed in medicine from the earliest times, as *A. Abrotanum* or Southern-wood, *A. vulgaris* or Mugwort, &c. *A. Dracunculus* or *Tarragon* is employed as a condiment in Europe.

Dr. Lindley states that the MOXA of China is prepared from the woolly leaves of *A. Moxa*, Dec. The inflammable cones or cylinders called Moxas are prepared in Europe from pith, cotton, &c.; these are now seldom employed, though they were at one time preferred to the actual Cautery, from acting more slowly as powerful counter-irritants, in some painful and spasmodic diseases, as well as in affections of the joints and viscera. In the Himalayas the tomentum of *Chaptalia gossypina* is used as amadou, and is applicable to the same purposes. (Himal. Bot. p. 247.)

The substance called by the various names, *Semen sanctum*, *Semen contra*, *Artemisia Santonica*, *Worm-seed*, &c., has long been in use as a vermifuge. It is exported from Barbary and Aleppo, as well as from Egypt and the Levant. It consists of the broken peduncles, involucres, half-blown flowers, and tops, of several little known species of *Artemisia*. The properties are said to depend upon a Volatile Oil, and a peculiar principle called *Santonine.*

ABSINTHIUM, L. E. Artemisia Absinthium, *Linn.* Herba florens, L. Herb, E. *Absinthium officinale et vulgare*, Auct. Wormwood.

The 'Αψίνθιον of the Greeks is corrupted into *Afsunteen* in the East, and other species of Artemisia are substituted for the present plant.

Root ligneous, branched. Stems numerous, bushy, furrowed, leafy, the whole plant covered with close silky hairiness. Leaves alternate, silky (tripinnatisect, *Dec.*), in many deep, lanceolate, obtuse segments; lower ones on long, the upper on short and broad footstalks. Floral leaves simple. Flower heads in leafy, clustered panicles, drooping, hemispherical, heterogamous; the outer scales of the involucre linear, silky; inner roundish, scarious. Florets of a pale yellow, the outer row female. Styles deeply cloven. Receptacle convex, covered with silky hairs.—Waste ground in various parts of Europe and the north of Asia.—Eng. Bot. t. 1230. St. and Ch. ii. 58. Should be collected in July and August, when in flower.

The dried herb or the flowering top has a greyish silky look; is remarkable for its disagreeable though somewhat aromatic odour; and for its intense bitterness, whence its name has passed into a proverb. Its properties are imparted to water, spirit, and wines. Analysed by Braconnot, it yielded, in 100 parts, Volatile Oil of a dark-green

colour, upon which the odour depends, 1·5, Bitter Azotized Extract 30, very Bitter Resin 2·5, Green Resin 5, with Chlorophyll, Albumen, Salts, and among them *Absinthate of Potash*, which, when the plant is burnt, is changed into Carbonate of Potash. This was long called Salt of Wormwood. The Bitter Extract contains a peculiar neutral principle, called *Absinthine*. Dr. Luck has obtained this by simply shaking up Ether with a strong alcoholic solution of the plant. The Ether is distilled off, and Resin separated by treating with a dilute ammoniacal solution. The formula is said to be $C_{16}H_{11}O_5$. It acts with great power, and without producing excitement. The Essential Oil ($C_{20}H_{16}O_2$), as ascertained by M. Lablanc, in its impure state is of a dark-green colour, and begins to boil at 356° F. Its boiling point rises to 401° as it coagulates. It may be distilled off Quicklime, and when thus purified, has a fixed boiling point of 401°; is acrid, with a penetrating smell, and Sp. Gr. ·975 at 75° F.

Action. Uses. Aromatic, Bitter, and Tonic; is added to some *liqueurs;* employed in Dyspepsia. Also Anthelmintic, hence its name of Wormwood.

The common Tansy, *Tanacetum vulgare*, is an indigenous plant with a strong peculiar odour, and bitter taste; it has long been used as a tonic and anthelmintic, but is now superseded by more active remedies.

ARNICA MONTANA. *Linn.* Mountain Arnica. Mountain Tobacco.

Arnica has long been employed in medicine, though there is no proof that it was known to the Greeks, as inferred by Mathioli. Several dissertations have been written upon its medical virtues, from the time of Lamarche, 1719, to the present day.

The plant when fresh and bruised, has rather an agreeable odour, which is apt to excite sneezing; the taste of the leaves and flowers is bitter and pungent, of the root-stock bitter and acrid. Some mountaineers smoke it like Tobacco. Dr. A. T. Thomson considered that Arnica contained an Igasaurate of Strychnia; but Versmann, having been induced by Dr. Pfaff to analyse it, finds that the aqueous infusion of the flowers of Arnica reacts as an acid, has at first a bitter, and afterwards a strong acrid flavour, depending on the presence of Gallic acid. Sol. of Gelatine renders an infusion of Arnica very turbid, and with Chloride of Iron it yields a black colour, which when largely diluted becomes green. On the addition of Magnesia or its Carbonate, an intensely green colour is produced after a few hours. He was unable to ascertain the presence of Strychnia, and, indeed, considered its absence as completely proved by his experiments. (P. J. iv.)

A peculiar alkaloid, *Arnicina*, was first discovered in Arnica by M. Lebourdais. Mr. Bastick has prepared it in the same manner as Lobelina, q. v., which it very much resembles in its properties.

Action. Uses. Acrid Stimulant; Irritant of the Digestive Canal;

is much esteemed for its power of discussing tumours and the effects of bruises (hence called *Panacea lapsorum* by Fehr.) when applied in the forms of Cataplasm, or of the Tincture, as indicated by Scopoli.

D. Of the Powder, gr. v.—gr. x. Of the Tincture (℥ij. of the Root in Proof Spirit f℥xvj.), ♏x.—fℨß., or applied externally.

Sub-Ord. III. Cichoreæ.

Florets all ligulate. Style cylindrical above and pubescent, as well as its long obtuse branches. Stigmatic lines prominent, narrow.—The Cichoreæ abound in milky juice, which is bitter-tasted and sometimes narcotic. By blanching, some become edible as salads.

Cichorium Intybus, or Wild Chiccory, which is indigenous in waste places all over Europe, is extensively cultivated on account of its root, which is much used as a substitute for, and as an addition to, Coffee. The medical properties of the plant are considered to be nearly the same as those of Taraxacum. It is used to adulterate Coffee, and is itself often much adulterated. (*v.* P. J. iv. 119.)

Taraxacum, L. E. D. Radix recens, L. Root, E. D. Dandelion.

Dandelion, being indigenous in Europe, has long been employed in medicine.

Root spindle-shaped, milky-juiced. Leaves numerous, radical, runcinate, glabrous, of a bright shining green. Scapes 1 or more, erect, brittle, with a single head of flowers, which expand in the morning, and are of a golden-yellow colour. Involucre double, external scales spreading or reflexed, internal ones in one row, erect, without callous tips. Receptacle naked. Achænium oblong, striated, muricate at the apex, terminating in a long beak. Pappus hairy, in many rows, radiating so as to form a light globe.—Fields and waste places throughout Europe, and extending even to the Himalayas.—E. B. t. 539. St. and Ch. 5.

The root of the *Apargia hispida*, or Rough Hawkbit, is said to have been extensively substituted for Dandelion by the collectors. Taraxacum root is crisp, dark brown, breaks easily, and exudes a milky juice. That of Apargia is wrinkled, pale, tough, and generally much larger in size.

The leaves, when young, are blanched and used as salad in some parts of Europe: their properties necessarily vary at different periods of growth. The sensible properties of the milky juice are said to be greatest just before inflorescence. The juice expressed from the bruised roots was found both by Mr. Houlton and Mr. Squire to be of a watery nature in March, but towards the end of summer thick and cream-like, and bitter in taste. Mr. Squire, moreover, found that in November and December 4 lbs. of the juice yield 1 lb. of Extract; from March to May, from 6 to 9 lbs. In June, July, and August, from 6 to 7 lbs. are required to yield the same quantity of Extract. Hence it is evident, that it is during November and December that it abounds most in solid ingredients, upon which its medical properties probably depend. Geiger pronounces the juice to be most bitter in midsummer; and in the spring and close of autumn it is sweetish, which Mr. Squire ascribes to the effects of frost. The juice

also contains Gum, Sugar, Albumen, Gluten, an Odorous principle, Extractive,—and a peculiar crystallizable Bitter principle, soluble in Alcohol and water.*

The most efficient mode of prescribing it is in the form of the inspissated juice. The root is sometimes roasted and used as a substitute for ground Coffee, or its dried powder is mixed with the latter.

Action. Uses. Aperient, Deobstruent, Alterative, especially in affections of the Liver, in chronic cutaneous diseases, &c.

DECOCTUM TARAXACI, L. E. Decoction of Taraxacum.

Prep. L. Boil fresh *Dandelion Root* bruised ℥iv. in *Dist. water* Oiſs. down to Oj. and strain.
E. The whole plant is used.

Action. Uses. The bitter principle being removed by the boiling water, this may be used in some cases requiring alterative treatment in doses of f℥iſs.

EXTRACTUM TARAXACI, L. E. Extract of Taraxacum.

Prep. L. Prepare as Extr. Liquorice.
E. Take fresh root of *Taraxacum* ℔j., boiling *Aq.* Cj. Proceed as for Extr. Poppy Heads.

Action. Uses. This is the most commonly employed Extract, in doses of gr. x.—ʒiſs. It should be bitter in taste, and of a brownish colour. But the inspissated juice of the roots pressed out and evaporated spontaneously by the action of dry air, or in vacuo, is the best form for exhibition. The inspissated juice is well prepared by Mr. Squire, Mr. Bell, and Mr. Hooper; the latter also prepares a Fluid Extract of Taraxacum, of which one or two teaspoonfuls form a dose.

LACTUCA, *Linn.*

Heads few-flowered. Involucre cylindrical, imbricated in 2—4 rows, outer row shorter, scales with a membranous margin. Receptacle naked. Achænium plano-compressed, wingless, terminating abruptly in a filiform beak.

LACTUCA SATIVA, *Linn.* L.D. Herba florens, L. The leaves, D. Garden Lettuce.

The common Lettuce (θρίδαξ) has been used in medicine from the time of the Greeks, as it still is in the East. It is cultivated throughout Europe, and in most European colonies, as a salad.

* Widnmann and Frickinger found *Mannite* in the expressed juice of Taraxacum. But the Messrs. Smith, of Edinburgh, have proved, what indeed was considered probable by the German observers, that this substance does not exist in the fresh root, but is produced subsequently by a kind of fermentation (called *viscous*) which takes place in the infusion or juice. It is supposed that Grape-sugar ($C_{12}H_{12}O_{12}$) is transformed into one atom of Mannite ($C_6H_7O_6$), and one of Lactic acid ($C_6H_5O_5$), the other atom of Oxygen being abstracted by some decomposing albuminous compound.

The common Lettuce is an annual, with an erect, smooth stem, which is two feet high, simple below, and branched above. Leaves rounded or oval, large, erect, narrowed at the base, smooth at the keel, half embracing the stem, often much wrinkled. Flowers appearing in August, yellow, smaller than those of *L. virosa*.

The Leaves of the Lettuce when young contain a pellucid pleasant-tasted juice, containing Mucilage and Sugar; but when the flowering stem begins to appear, the juice becomes milky, bitter in taste, and of a strong odour, something like that of Opium. These characteristics increase until the flowers have blown. If slices of this stem be cut off, or incisions made into its cortical portion, the milky juice exudes, and on drying becomes of a brownish colour, forming what is called *Lettuce Opium* or *Lactucarium*, to which Dr. Coxe of Philadelphia and Dr. Duncan, Sen., of Edinburgh, first called attention. Dr. Francois subjected it to further examination, calling it *Thridace*.

Action. Uses. Anodyne, Diaphoretic, and slightly Diuretic, in doses of gr. ij.—gr. vj. Used to allay Cough and Nervous Irritation, to relieve the pains of Rheumatism, &c., and to induce sleep.

EXTRACTUM LACTUCÆ, L. Extract of Lettuce.

Prep. Bruise the fresh leaves of *Garden Lettuce*, sprinkled with water, in a Wedgewood or stone mortar, and then press out the juice, and evaporate to a proper consistence.

Action. Uses. Contains little of the active principle or Lactucarium, though it resembles it in colour, odour, and taste; is a little sedative in doses of gr. v.—℈j.

LACTUCA VIROSA, *Linn.* E. D. The Inspissated Juice, E. Strong-scented Lettuce.

This is supposed to be the θρίδαξ ἀγρία of Dioscorides, though *L. Scariola*, Linn. is adduced by Dr. Sibthorp as the plant. This has glaucous vertical leaves, but the same properties as the former.

The Wild Lettuce abounds in acrid milky juice, has a tap-shaped root, with round and erect, slender, glaucous stem, 2—4 feet high, a little prickly below, panicled above. Leaves horizontal, with a prickly keel, otherwise nearly smooth, finely toothed; radicle ones obovate, undivided, those of the stem smaller, often lobed, auricled, and semiamplexicaul. Flower-heads numerous, panicled, with numerous small, heart-shaped, pointed bracts. Florets light yellow. Achænia striated, beak white, equalling in length the black fruit.—Dry banks and borders of fields throughout Europe.—E. B. t. 1957. Flowers about August.

This plant, distinguished by its rank smell and the blood-red spots on its stem, is preferred to the former by the E. C. as a source of Lactucarium. Dr. Christison states from information communicated to him by Mr. Duncan of Edinburgh, that it yields a much larger quantity and a superior quality of Lactucarium, especially before the middle period of inflorescence; and Schutz has found in Germany that a single plant of L. sativa yielded only 17 grs., while one of L. virosa produced no less than 56 grs. of Lactucarium.

LACTUCARIUM, E. D. The Inspissated Juice of *L. sativa* (D.) and of *L. virosa* (E. D.) Lettuce Opium.

Lactucarium is prepared by pressing out the milky juice of the incised stems of the above plants when in flower, and then evaporating it to a proper consistence in a water-bath. This at least forms the best kind. It is of the consistence of a dry extract, and is sold in roundish, rather hard lumps, having a brown colour, an opium smell, and a bitter and slightly acid taste. It is apt to attract moisture. That made near Edinburgh is "in pieces about the size of a field bean, rough and irregular, wood-brown in colour, with an ash-grey efflorescence, friable, reddish-brown in powder, of the same odour with the former, but more acrid and bitter to the taste." (*c.*) Analyzed by Walz, it was found to contain a Volatile Oil, a yellowish-red tasteless Resin, a greenish-yellow Acrid Resin, Crystallizable and Uncrystallizable Sugar, Gum, Pectic acid, Albumen, various kinds of Extractive, a concrete Oil or Wax (one part of which, insoluble in ether, is the same as the Caoutchouc of other analysts), Oxalates, and other salts—with a neutral active principle, which has been named *Lactucine.* This is in acicular crystals, colourless, without odour, very bitter, fusible, soluble in about 70 parts of water, more so in Ether, Alcohol, and diluted acids. Its watery solution is very bitter, neutral, and not precipitable by any reagent. (Walz, Ann. der Pharm. xxxii.)

Action. Uses. Narcotic; suited to allay pain and induce sleep, in the same cases as Henbane, and where Opium is ineligible, in doses of gr. v.—℈j.

TINCTURA LACTUCARII, E. Tincture of Lactucarium.

Prep. Take *Lactucarium* in fine powder ℥iv., *Proof Spirit* Oij. Best prepared by percolation, but also by digestion, as Tinct. Myrrh.

Action. Uses. Anodyne, &c. as above, in doses of ♏xx. to f℥j.

TROCHISCI LACTUCARII, E. Lettuce Lozenges.

Prep. Lactucarium ℨij. To be prepared in the same proportion and manner as the Opium Lozenge.

D. May be taken to the extent of xx.—xl. daily.

M. Aubergier prepares a Spirituous Extract of Lactucarium, which contains all the active principles, and may be prescribed in pills, or made into a syrup by adding 1 part to 500 of syrup.

LOBELIACEÆ, *Juss.* Lobeliads.

The Lobeliaceæ are allied to Cichoreæ and to Campanulaceæ. Found in tropical and temperate parts of the world. They secrete a milky juice, often very acrid and narcotic.

LOBELIA, L. E. D. Lobelia inflata, *Linn.* Herba florens, L. The Herb, E. D. Indian Tobacco. *Pentand. Monog.* Linn.

This plant was first employed by the natives and then by the medical practitioners of the United States, and in this country first in 1829.

Annual or biennial, with fibrous root. Stem erect, angular, the upper part branched and smooth. Leaves irregularly serrate, dentate, hairy; the lower ones oblong, obtuse, with short petioles; those towards the middle ovate-acute, sessile. Flowers in racemes. Calyx smooth, tube ovoid, 5-lobed, segments linear-acuminate. Corol of a light blue, cleft longitudinally from above, bilabiate, the upper lip narrow, the lower broader, 3-cleft. Anthers united into an oblong curved body, the two inferior barbed at the point. Style filiform; stigma curved, inclosed by the anthers. Capsule 2-celled, ovoid, ten-angled, inflated, crowned with the calyx. Seeds numerous, small, of a brown colour.* Common weed in the United States from Canada to Carolina.—Esenb. and Eberm. 206.

The whole plant when wounded exudes a milky juice, and all parts are possessed of medicinal activity; but, according to Dr. Eberle, the root and inflated capsules are the most powerful. The dried herb is of a pale greenish-yellow colour, of a faint disagreeable smell, and a burning acrid taste, especially perceptible in the fauces. It is generally compressed into rectangular cakes by the Shaking Quakers of New Lebanon, in New York. The active properties are extracted by Proof Spirit and by Ether. It has not yet been satisfactorily analysed. But two peculiar substances have been obtained from it. By treating the decoction with Sulph. Copper, and decomposing the precip. with a current of HS, Mr. Procter, of America, has isolated a peculiar acid. *Lobelic acid* is crystalline, soluble in water, alcohol, and ether. It precipitates Sulph. Copper light green, Persulph. Iron olive-brown, Acetate Lead or Baryta yellow, and Nitrate Mercury greyish white. (P. J. x. 456.)

The presence of a peculiar active principle, *Lobelina*, has been indicated by Calhoun, Pereira, and others. This is described by Mr. Bastick as a volatile liquid base, sol. in water, alcohol, and ether; decomposed, but not precipitated, by caustic Alkalis. It has a strong alkaline reaction, pungent taste, and faint smell. Being destroyed by an alkali, it cannot be prepared like Conia and Nicotia. Mr. Bastick gives the following formula for its preparation. (P. J. x. 271.)

Macerate ℔ij. of *Lobelia* for 48 hours in *Alcohol* Cj., to which previously has been added f℥iij. of *Sulph. acid.* Drain off and filter the alcoholic solution. Mix in with agitation powdered *Caustic Lime*, until the fluid has an alkaline reaction. Filter, and add Sulph. acid to slight excess. Again filter, and evaporate with a gentle heat until reduced to about ¼th. Add to the residue a little water, and again evaporate until all trace of spirit has disappeared.

* These seeds are seen by a magnifying glass to be ovoid, and marked with cross ridges and furrows, like basket-work. Being thus easily distinguished from all other seeds, they were discovered by Mr. Curtis in a secret powder vended by a Mr. Coffin, from the use of which some fatal cases of poisoning occurred some time ago.

Filter to remove resin. Then gradually add an excess of Carb. Potash, filtering if there is any precipitate. Agitate now with successive portions of ether, until it will no longer dissolve out anything more. By carefully separating and evaporating the ether spontaneously, the Lobelina is left tolerably pure. It may be further purified by solution in alcohol, and digestion with Anim. Charcoal, &c. (*v.* p. 288.)

Action. Uses. Narcotic, Acrid, Antispasmodic, acting in many respects like Tobacco; in large doses Emetic and Cathartic. Used to control attacks of Spasmodic Asthma, either by giving it in full doses so as to excite vomiting, or in small doses repeated until sickness comes on.

D. The dose of the Powder as an expectorant, gr. j.—gr. v.; as an emetic, gr. x.—℈j.

TINCTURA LOBELIÆ, L. E. D. Tincture of Lobelia.

Prep. L. Digest powdered *Lobelia* ℥v. in *Proof Spirit* Oij. for 7 days, then press and strain. D. Similar.

E. It is much better prepared by percolation, as Tinct. Capsicum.

Action. Uses. Expectorant in doses of ♏x.—f℈j. Antispasmodic, f℈j.—f℈ij. every two or three hours. Emetic in doses of f℈iv.

TINCTURA LOBELIÆ ÆTHEREA, L. E. Ethereal Tincture of Lobelia.

Prep. L. Macerate *powdered Lobelia* ℥v. in *Ether* f℥xiv. and *Sp. Rect.* f℥xxvi. for 7 days, then press and strain.

E. *Ether* Oij., no spirit. Or make by percolation.

Action. Uses. Similar to Whitelaw's Ethereal Tincture. Used chiefly as an Antispasmodic. Contains *Lobelina.*

ERICACEÆ, *Endlicher.* Heath-worts.

The Ericaceæ are found in the cold and temperate parts of the northern hemisphere, and in southern Africa. Many are astringent, some also stimulant, —hence employed as substitutes for Tea, as *Gaultheria procumbens* and *Ledum latifolium.* Some have succulent edible fruit. *Rhododendron Chrysanthum* is much employed by the Russians as a stimulant diaphoretic in rheumatism. *R. campanulatum* is employed in the Himalayas as snuff.

Tribe *Ericeæ.* Fruit capsular. Anthers 2-celled. Disk hypogynous. Testa close.

UVA URSI, L. E. D. Arctostaphylos Uva Ursi, *Spr.* Folium, L. Leaves, E. D. Bearberry. *Decandria Monogynia,* Linn. *Trailing Arbutus.*

It is uncertain when this plant was first employed medicinally. Quer maintains that the Spaniards first discovered its nephritic properties.

Evergreen procumbent shrub. Leaves coriaceous, obovate, obtuse, quite entire, shining, of a deep green above, lighter colour and covered with a network of veins on the under surface, hence reticulated. Flowers in terminal clusters of

8 or 10, each supported by 3 small bracts. Calyx 5-partite, of a pale red. Corol rose-coloured, ovate-urceolate, 5-cleft, border revolute. Stamens 10, inclosed, filaments flattened. Anthers compressed, with 2 pores at the apex, and furnished laterally with 2 reflexed arms. Ovary globose, supported by 3 scales. Style short. Stigma obtuse. Berry globose, scarlet, with 5 single-seeded cells.—Stony Alpine heaths of Europe, Asia, and North America. — Esenb. and Eberm. 215. St. and Ch. 91.

Fig. 77.

The leaves are the officinal parts, and usually collected in autumn. They have sometimes been adulterated with the leaves of Vaccinium Vitis Idæa, or Wortleberry; but these are *dotted* on their under surface, and have their margins revolute and somewhat crenate. The Box leaf is devoid of astringency. Uva Ursi leaves, when dried and powdered, have an odour not unlike that of hay; the taste is bitter and astringent. The active properties are extracted both by water and Spirit. The watery infusion is precipitated by Gelatine, and a bluish-black colour is produced with the Sesquichloride of Iron.

They contain *Tannin*, about 36 per cent. Kawalier has analyzed them, and found besides this, *Gallic acid*, Fat, Wax, Chlorophyll, a little Sugar and Vol. Oil, with a peculiar substance called *Arbutine*. This is probably the active principle, being modified by the astringency of the Tannin. It crystallizes in long, thin, colourless prisms, soluble in water, alcohol, and ether. Its formula is $C_{32}H_{24}O_{21}$. It is neutral. As Salicine forms Saligenine, so, under the influence of water and emulsine, Arbutine changes into Grape-sugar and another neutral substance, called *Arctuvine*. (Annal. der Chem., May, 1852.)

The leaves of Uva Ursi are employed in tanning in some parts of Russia.

Action. Uses. Astringent Tonic and mild Diuretic. Chiefly applicable in chronic cases of an increased secretion of mucus from the bladder, in doses of the powder gr. x.—ʒß.

Decoctum Uvæ Ursi, L. D. Decoction of Bearberry.

Prep.. L. Take bruised *Uva Ursi* ℥j., *Aq. dest.* Oiß. Boil down to Oj. and strain.

Action. Uses. Tonic, mild Diuretic, in doses of f℥iß.—℥iij. three times a day.

Extractum Uvæ Ursi, L. Extract of Bearberry.

To be prepared like Extract of Hop.

Action. Uses. Tonic in doses of grs. v.—grs. x. two or three times a day.

Tribe *Vacciniecæ*, distinguished by their baccate, fleshy, and inferior fruit, with an epigynous disk, contains Cranberries, Bilberries, and Whortleberries.

Tribe *Pyroleæ*. Fruit capsular, dry. Seeds with a loose testa. Disk 0. Anthers opening by pores.

Chimaphila, L. D. Chimaphila umbellata, *Nuttal.* *C. Corymbosa*, Pursh. Herba. The Herb. Winter Green. *Decand. Monog.* Linn.

This plant, called *Pipsissewa*, was first employed medicinally by the native Americans, and then by the European settlers. It was made known to the profession by Dr. Mitchell in 1803, and then by Mr. Carter and Dr. Somerville. (Medico-Chirurg. Trans. vol. v.)

Small evergreen shrub, with creeping root-stock. Leaves coriaceous, with short petioles, cuneate-lanceolate, coarsely serrated, smooth, and shining. Flowers drooping, in small corymbs, with linear awl-shaped bracts. Calyx 5-cleft. Petals 5, white, with a tinge of pink, spreading. Stamens 10, filaments smooth, dilated in the middle. Ovary roundish, obtusely angular, umbilicated. Style short, concealed in the umbilicus of the ovary. Stigma orbicular, 5-lobed. Cells of the capsule dehiscent at the apex, the valves unconnected by tomentum.—A native of mossy turf in the woods in the northern latitudes of America, Europe, and Asia. Flowers in June and July.—Esenb. and Eberm. 93. St. and Ch. 93.

The fresh leaves, when bruised, exhale a peculiar odour; the taste is pleasantly bitter and astringent; that of the stems and roots is said to be pungent. They contain Gum, a little Tannin, Bitter Extractive, Resin, Saline matter and Lignin. Dr. A. T. Thomson indicated the presence of Gallic acid.

Action. Uses. Acrid and Tonic. The fresh leaves applied to the skin produce rubefaction. The infusion or decoction, taken internally, acts as a Diuretic and Tonic, and has been prescribed in Dropsies accompanied with debility, and in chronic affections of the Urinary Organs, also in Scrofulous complaints.

Decoctum Chimaphilæ, L. D. Decoction of Winter Green.

Prep. L. Boil *Chimaphila* ℥j. in *Aq. dest.* Oiß. down to Oj. and strain. D. ℥ß. to Oß.

Action. Uses. Diuretic and Tonic. The Decoction strikes a deep green with ferruginous salts, and may be given in doses of f ℥j.—f ℥iij. every three or four hours.

STYRACEÆ. *Rich.* Styrax Tribe.

Found in the tropical parts of Asia and of America, with one species in the Mediterranean region, and others in Japan. Remarkable for the secretion of Benzoic and Cinnamic acids in Styrax and Benzoin.

STYRAX, *Linn.* *Decand. Monog.*

Calyx rather campanulate, nearly entire, or 5-toothed. Corolla campanulate at the base, deeply 3—7 cleft. Stamens 6—16, seldom 10, exserted; filaments united to the tube of the corol, sometimes adhering at the base into a ring; anthers linear, 2-celled, opening by internal longitudinal slits. Ovary inferior, Style simple. Stigma obtuse, somewhat lobed. Drupe dry, splitting imperfectly into 2 or 3 valves, with 1—2—3 stones. Seed solitary, erect, with a large, leafy, thin embryo lying in the midst of fleshy albumen, with an inferior radicle. (*Lindley.*)—Styrax officinale and S. Benzoin yield officinal products.

STYRAX, L. E. Planta incerta, L. Styrax officinale, *Linn.* E. Balsamum liquidum, L. Balsamic exudation, E. Officinal Storax.

Storax (στύραξ) was well known to the Greeks. Dioscorides compares the tree producing it with the Quince tree. It is called *asteruk* in the East.

A small tree (fig. 78), with smooth bark, and downy shoots and petioles. Leaves ovate-obtuse, of a green colour, and shining above, white and downy on the under-surface, something like those of the Quince tree. Flowers white, in terminal racemes of a few flowers, which resemble those of the Orange. Calyx downy (2), cup-shaped, 5 to 7 toothed. Corolla externally hairy, with 5 to 7 segments. Stamens (2) 10 to 16. Fruit about the size of a cherry, coriaceous, downy, with 1 or 2 nuclei.—A native of Asia Minor and Syria, common in Greece, and cultivated in the south of Europe. As this plant does not yield a balsamic exudation in all these situations, some Storax has been thought to be yielded by *Liquidambar orientale* and *L. altingia*. Du Hamel, however, states that he has seen it flow from a tree near the Chartreuse of Montriau.—Esenb. and Eberm. 210. Fl. Græc. t. 375. St. and Ch. 47.

Much of the Storax of commerce is probably obtained by incisions made into this tree. It is common in Asia Minor, where Professor Forbes was informed Storax was collected from it. Several kinds are known in commerce and described in books. (*v.* Pereira.) But now only two kinds are known in English commerce; the Solid Storax, or *Styrax Calamita;* and the Liquid Storax, officinal in the L. P. Both are imported from Trieste. The first is a very impure product, consisting of a balsamic Resin, mixed up with sawdust, Benzoin, and sometimes Turpentine, into brownish friable cakes. Merat and De Lens state that it is thus manufactured both in the Levant and at Marseilles. When exposed, it becomes white with an efflorescence of Benzoic (?) acid. Solid Storax is officinal in the E. P.

Liquid Storax is usually more or less opaque, of the consistence of birdlime, greyish colour, warm balsamic taste, and peculiar vanilla-like odour, if pure. These properties are quite distinct from those of the known products of the genus *Liquidambar*. (*v.* p. 532.)

Fig. 78.

One kind of Liquid Storax is yielded in the islands of Cos and Rhodes, according to Landerer, by *Styrax officinale*, which is there called *βουχουρι*. This seems to be only the Arabic word *Bukhoor*, signifying incense or fumigation, put into Greek letters.

Liquid Storax has been analyzed by Simon, and found to contain several peculiar substances. (1.) A Volatile Oil, called *Styrole*, having the formula $C_{16}H_8$, very volatile, burning with a sooty flame, and with the peculiar odour of Storax. (2.) *Cinnamic acid*, contained also in the balsams of Peru and Tolu. It resembles Benzoic, but may be distinguished from it by producing an odour of the Oil of Bitter Almonds when heated with a solution of Chromic acid. (3.) *Styracine*, a crystalline neutral substance, soluble in alcohol and ether, but insoluble in water. (4.) Two peculiar resins. Storax yields little more than its odour to water, but is mainly dissolved by Rectified Spirit.

STYRAX PRÆPARATA, L. Prepared Storax. Extractum Styracis, E. Extract of Solid Storax.

Prep. L. Dissolve *Storax* ℔j. in *Rectified Spirit* Oiv. Strain through linen, and with a gentle heat distil off most of the Spirit; evaporate the remainder in a water-bath to the right consistence.

E Similar; *solid* Storax in fine powder being used.

Action. Uses. Stimulant Expectorant in Chronic Coughs, in doses of gr. x.—℈j. It forms an ingredient of the Tinct. Benzoini comp.

PILULA STYRACIS COMPOSITA, L. Pil. Styracis, E. Compound Storax Pill.

Prep. L. Beat together *Prepared Storax* ʒvj. with *powdered Opium* and *Saffron* āā ʒij., that a mass may be formed.
E. 2 parts of Storax to 1 of each of the others.

Action. Uses. Employed as a means of administering opium. 1 gr. of this is contained in 5 gr. of the L., and in 4 grs. of the E. prep.

BENZOINUM, L. E. D. Styrax Benzoin, *Dryander.* Balsamum ex inciso cortice fusum, aere induratum, L. Concrete exudation, E. D. Benzoin. *Gum Benjamin.*

Benzoin has long been employed medicinally and as incense in the East. In Bengal it is called by a name (*looban*), which in N. W. India is applied only to Olibanum (*v.* p. 382). In Persian works on Materia Medica it is distinguished by the names of *hussee looban* and *hussee-al-jawee* (*v.* Himal. Bot. p. 261). The name *hussee* appears to be the original of *assa*, as mentioned at p. 461, and Benzoin we know is in old works called *asa dulcis.* Mr. Marsden ascertained it to be yielded by a tree which Mr. Dryander named Styrax Benzoin. Haynes supposed it to constitute a distinct genus, *Benzoin*, which Blume had already named Lithocarpus.

A tree of considerable size, but small when tapped, of quick growth. Branches and footstalks round, downy. Leaves oblong, acuminated, smooth above, white and tomentose underneath. Racemes compound, axillary, nearly as long as the leaves, flowers on one side with short pedicels. Calyx campanulate, obscurely 5-toothed. Corol of 5 petals of a greyish white colour, which are perhaps united at the base, four times longer than the calyx. Stamens 10, inserted into the receptacle. Ovary superior, ovate, tomentose. Style filiform. Stigma simple. —Native of Java, Sumatra, Siam, and Laos, Borneo, &c.—Esenb. and Eberm. 111.

Benzoin is obtained in Sumatra by making incisions into the tree in its seventh year. The juice which flows first is the purest and most fragrant: it hardens on exposure to the air. That which flows subsequently is brownish, and some is scraped out when the tree is cut down and split open, as it is soon killed by the process of tapping. These varieties are in commerce called *head*, *belly*, and *foot* Benzoin, and have the relative values to each other of 105, 45, and 18, being esteemed according to their whiteness, semi-transparency, and freedom from admixtures. It is also produced in Siam, whence it has long been an article of commerce. The specimen given by the Author to Dr. Pereira, and named by him *Translucent Benzoin*, was obtained from Bankok. This may be produced by *Styrax Finlaysonianum;* but *S. Benzoin* may grow in the interior, as much surface moisture and umbrageous forests prevail, which will produce a climate very similar to that of a tropical island. *Benzoin in tears* is a fine kind, but

seldom met with. The best kind common in commerce is in masses composed of whitish or reddish tears agglutinated together by a darker-coloured portion of the same balsam. This is *Amygdaloidal Benzoin.* An inferior kind of a dark-brown colour, is sometimes called Calcutta Benzoin. Though the history of some varieties requires investigation, this had no doubt been previously imported, as Benzoin is always mentioned as one of the imports into Calcutta, Madras, and Bombay, from countries still more to the eastward. Benzoin, though hard, is friable, presenting a resinous mottled fracture; has an agreeable fragrant odour, more perceptible if rubbed; taste somewhat sweetish and balsamic, irritating the fauces if much chewed; its powder excites sneezing. Sp. Gr. 1·092. Heated, it melts, and emits white irritating fumes of Benzoic acid, also of an empyreumatic oil, and finally burns away. It is soluble in Alcohol and in Ether, being precipitated on the addition of water, forming a milky emulsion. Some acids dissolve it. It consists of a trace of Volatile Oil, Benzoic acid, from 12 to 20 per cent., Resin, from 78 to 80 per cent.—some of which is soluble, and another part insoluble in Ether—Woody matter, and Water. The White and Brown Benzoins contain nearly the same quantity of Benzoic acid; but the latter contains only about 8 per cent. of the soluble, and the white Benzoin very little of the insoluble resin.

Action. Uses. Stimulant Expectorant. Formerly much employed in Chronic Catarrhs and in fumigations.

TINCTURA BENZOINI COMPOSITA, L. E. Compound Tincture of Benzoin.

Prep. L. Macerate for 7 days *Benzoin* coarsely powdered ℥iijß., *Prepared Storax* ℥ijß., *Balsam of Tolu* ʒx., *Aloes, Socotrine* or *Hepatic*, coarsely powdered ʒv., in *Rectified Spirit* Oij. Filter.
E. Similar: *Bals. Peru* instead of *Storax*,—no *Tolu.*

Action. Uses. Stimulant, Expectorant, in doses of fʒß.—fʒij. Sometimes made into an emulsion, or added to pectoral mixtures to improve their flavour. Formerly used as an application to cuts and bruises, under the name of *Friar's balsam.*

ACIDUM BENZOICUM, L. E. D. Benzoic Acid.

Benzoic Acid ($C_{14}H_5O_3$+aq.=122), though named from Benzoin, is also produced by the action of reagents on several vegetable substances, as of an oxidizing agent on the Oil of bitter almonds. It is considered to be an oxide of the hypothetical radicle *Benzoyle* or *Benzule* ($Bz{=}C_{14}H_5O_2{=}105$). This has been already mentioned at p. 435. The pure Oil of Bitter Almonds is a Hydruret of Benzule. When this is exposed to the atmosphere, oxygen is absorbed, and some Benzoic acid formed. The latter is also formed in the Urine of some herbivorous quadrupeds, by the decomposition of Hippuric acid.

It is usually obtained from Benzoin, either by subjecting it to the action of heat—or to that of a base, from which it is afterwards separated by a stronger Acid. It used to be supposed that Benzoic acid was also an ingredient of the Balsams of Peru and Tolu, as well as of Storax. But it has now been proved that these contain another acid, analogous in its properties to Benzoic, *viz.* Cinnamic acid. Benzoic acid, when taken into the human system, undergoes the exact reverse of the change alluded to above as taking place in the Herbivora, being eliminated in the urine in the form of Hippuric acid.

Benzoic Acid, when obtained by sublimation, is in soft, feathery, flexible crystals, which have a pearly lustre, and, when pure, are quite colourless, but as obtained by the action of heat, have a little empyreumatic oil intermixed, which increases the odour, and does not impair the medical properties. From a solution, Benzoic' crystallizes in transparent prisms. It has a warm, acrid, slightly acid taste; a little volatilizes at ordinary temperatures. It melts under 212°, and on a little increase of temperature sublimes entirely, and burns away; it is soluble in about 25 parts of boiling, and not less than 200 parts of cold water, but very readily in Alcohol: it combines with Alkalis and Metallic Oxides. It is composed of 1 Eq. Benzule 105+1 Eq. Oxygen 8=113+1 Eq. of Water when crystallized.

Tests. White, or nearly so; by the cautious application of heat it is sublimed, emitting a peculiar odour. Water dissolves it sparingly, but rectified Spirit readily. Solutions of Potash, Ammonia, Soda, or Lime, dissolve it entirely, and Hydrochloric acid throws it down again. L.

Prep. Contained in Mat. Med. L. P. Defined as crystals obtained from Benzoin by sublimation.

E. Benzoin is heated gradually in a glass matrass, so as to sublime the acid; the sublimate is then pressed between folds of blotting paper to remove the oil, and resublimed.

The D. C. make use of an iron pot, and sublime the acid into a cylinder of paper. The usual plan is to sublime from this iron pot into a pasteboard box fixed above it, and containing loose pieces of blotting paper, interposing between the pot and this box a sheet of fine muslin.

Another mode of preparation is to boil powdered Benzoin with a solution of an alkaline Carbonate, or with Hydrate of Lime. The resulting liquid contains a soluble Benzoate, and Benzoic acid may be thrown down from it by the addition of Hydrochloric acid.

Action. Uses. Stimulant, Expectorant, may be given in doses of gr. v.—℈j. but is chiefly used as an ingredient of Paregoric (Tinct. Camphoræ Comp.) and of Tinc. Opii Ammoniata, E.

Inc. Alkalis, their Carbonates and Metallic oxides.

Oleaceæ. *Lindl.* Olive Tribe.

The Oleaceæ are found in the warm and temperate parts of the northern hemisphere and a few in mountainous situations in India. They are valued

for the hardness of their wood, and ornamental flowers; the Olive-tree also for its fruit and oil, and the species of Fraxinus for Manna.

Divided into two groups. { 1. Oleineæ. Fruit drupaceous or baccate.
2. Fraxineæ. Fruit capsular, indehiscent, samaroid.

OLIVÆ OLEUM. L. E. D. Olive Oil. Olea Europæa, *Linn.* European Olive. Oleum e fructu expressum, L. Oil expressed from the pericarp, E. D. *Diand. Monog.* Linn.

The Olive tree, ἐλαία of the Greeks, *Zait* of the Bible, and *Zaitoon* of the Arabs, is one of the most celebrated and useful of trees.

Fig. 79.

The olive tree (Fig. 79) is usually small, evergreen, but of a dull aspect; wood hard. Leaves with short petioles, ovate-lanceolate or lanceolate, mucronate, of a greyish green colour above, hoary beneath. Flowers white, in short axillary clusters. Cal. (2) small 4-toothed. Corol with short tube and 4-cleft limb (1). Stamens 2, a little exserted. Style short Stigma (2) bifid, segments emarginate. Ovary 2-celled, 2-seeded. Drupe (3) about the size of a damson, purple coloured, containing only one sharp-pointed nut.—A native probably of Asia, early cultivated in Syria and Greece. The varieties of the olive are numerous. The var. *longifolia* is chiefly cultivated in the S. of France and Italy, and the var. *latifolia* in Spain. — Esenb. and Eberm. 212. St. and Ch. 15.

The leaves and bark of the Olive tree have been used in medicine; it produces a peculiar resinous exudation, called *Olivile* and *Olive gum;* and the bark has been employed as a substitute for Cinchona.

The fruit of the Olive—though esteemed even in its unripe state, as an article of the dessert, for which purpose it is first steeped in an alkaline ley, and then preserved in salt and water—is chiefly valued on account of the bland fixed oil which is stored up in its outer fleshy part. This is obtained either by at once bruising the nearly ripe fruit with moderate pressure in a mill (*Virgin Oil*), or by the aid of boiling water and greater pressure, or after fermentation has taken place in

the olives collected in heaps. In these latter ways *ordinary* and inferior oils are obtained, the worst being employed only as lamp-oils or in the manufacture of Soap. The finest oils are produced near Aix, Montpellier, Nice, Genoa, Lucca, and Florence. Olive oil is also largely produced in the kingdom of Naples, and exported from Gallipoli, on the East coast of the Gulf of Taronta, whence it is commonly called Gallipoli Oil.

Olive oil may be taken as the type of the *Fatty* or *Fixed Oils*, called also *Expressed Oils*. It is of a pale yellow, or light yellowish-green colour, without smell when fresh, having a bland, somewhat sweetish, fatty taste. It is very limpid. Sp. Gr. 0·910 at 77°. It is insoluble in water, readily dissolved by volatile oils, and by twice its bulk of Ether, but requires much more Alcohol.* Exposed to the air it absorbs Oxygen and becomes rancid, but does not dry like Linseed oil, and is therefore preferred for machinery. At 38° F. it begins to congeal, and is readily separated at 20° into two distinct bodies, of which one is fluid, called *Elaine*, or *Oleine*, and the other solid, named *Margarine* from its pearly aspect. This is often deposited in jars and casks of the oil. The Elaine forms about 72, the Margarine 28 per cent. Hyponitrous acid converts Olive Oil into a concrete mass by producing the oleaginous principle, Elaidine, mentioned at p. 217. If this, or any other fixed oil, is heated with Alkaline solutions, or with the Oxide of Lead, great changes take place, as exemplified in the making of Soap (v. Sapo) and of Lead Plaster, p. 176.

Tests. Olive Oil is apt to be adulterated with poppy and other oils; these are distinguished by not congealing at the same temperature as olive oil, also by retaining air, when shaken up, more readily than pure olive oil. Olive oil, when pure, may be completely solidified by ice. The E. P. states that "when carefully mixed with a twelfth of its volume of solution of Nitrate of Mercury, prepared as for the Unguentum Citrinum (v. p. 216), it becomes in three or four hours like a firm fat, without any separation of liquid oil." If 5 per cent. of any other oil be present, the consolidation is slower and less firm, but if there be 12 per cent., the foreign oil floats on the surface for several days. (*c.*) M. Gobley has invented an Elaïometer. (P. J. iii. 293.)

Action. Uses. Nutrient, Emollient; given internally in irritant poisoning; externally relaxing, much employed for frictions and for embrocations, and to give consistence to Cerates, Ointments, and Plasters: a good application to the hair, from not drying readily. In doses of f℥j. laxative; added to enemata for its emollient effect, or to dislodge ascarides.

Contained in many officinal Liniments.

* Pure Olive Oil is comparatively insoluble in alcohol, but if mixed with 2 or more volumes of Castor Oil, which is soluble in alcohol, the two together may then be completely dissolved in Rect. Spirit, as ascertained by Dr. Pereira. (P. J. ix. 502.)

SAPO, L. Sapo durus, E. D. Ex Olivæ oleo et Sodâ confectus, L. *Spanish or Castile Soap*, made with Olive Oil and Soda, E.

The manufacture of Soap was known to the Romans, and has long been practised in India. It depends upon the action of Alkalis, and of oxide of lead, upon fixed oils and fatty substances. Hard, or, as it is often called, Castile Soap, is made by heating together Olive oil and a solution of caustic Soda. Combination gradually takes place, a viscid homogeneous mass is formed, which is readily soluble in water, and from this solution the Soap may be precipitated by a strong alkaline or saline solution. Soap, when of good quality, is "white, does not stain paper (with oiliness), is free of odour, and dissolves entirely in rectified Spirit," E. The mottled kind is less fit for medical use, because it is coloured by the addition of Sulphate of Iron, which becomes decomposed, and the black Protoxide, being precipitated, by the action of the oxygen of the air is converted into the red Sesquioxide of iron. Oleine and Margarine, of which most of these fixed oils are composed, consist respectively of two acids, *Oleic* and *Margaric*, in combination with a base *Glycerine*. In the process of saponification, these compounds are decomposed by an alkali. Soap is formed, which consists of the alkali combined with these acids, as Oleate and Margarate of Soda or Potash. At the same time Glycerine, which is soluble in water, is set free. The soap separates from the Glycerine and the alkaline ley with which it has been formed, when the latter is concentrated by heat, or when a solution of common salt is added by the manufacturer. It rises to the surface, and is skimmed off with ladles. Some oils and animal fats contain Stearine, a substance closely allied to Margarine: in that case some *Stearic acid* is contained in the soap. All Soaps are slightly alkaline, feel soft and slippery, and are detergent. The watery solution is readily decomposed by acids, also by earthy and many metallic salts; hence, when water holds any of them in solution, instead of dissolving, the soap becomes decomposed. Such waters are called *hard*, while those which are comparatively pure are called *soft* waters. Castile Soap is composed of 9 to 10·5 of Soda, 76·5 to 75·2 of Oleic and Margaric acids, and 14·3 to 14·5 of water (*Ure*). Common Soap, made of Tallow and Soda, and Yellow Soap, of Tallow, Resin, and Soda, are not so well adapted for medical use.

SAPO MOLLIS, L. E. Ex Olivæ oleo et Potassâ Confectus, L. Soft Soap, made with Olive Oil and Potash, E.

Soft Soap, as used in the arts, is made with Caustic Potash, Fish-Oil, and Tallow; is semitransparent, of the consistence of honey, brownish-coloured, and nauseous. That referred to by the Colleges as made with Potash and Olive Oil, and for which the L. C. states that the other should on no account be substituted, Dr. Pereira was unable to meet with. He found on inquiry that common Soft Soap was usually substituted in making *Ung. Sulphuris Comp.* L.

Action. Uses. Soap is Antacid, and hence used as an Antilithic; its alkali being readily set free, it is sometimes conveniently used in poisoning by acids, and given in large quantities without causing irritation. Or its Oil being set free, it becomes useful in cases of habitual costiveness, especially when combined with Rhubarb, Aloes, or Colocynth Extract. Useful as a detergent in many cutaneous diseases, and externally, from its lubricity, it is well suited for embrocations, &c., and is very commonly employed in liniments.

PILULA SAPONIS COMPOSITA, L. D. Compound Soap Pill.

Prep. L. Beat together into a uniform mass *Opium powdered* and *powdered Liquorice* āā ʒij., *Soft Soap* ʒvj.
D. *Opium* ℥ß., *Castile Soap* ℥ij., and *Dist. water* fʒß.
5 gr. contain 1 of Opium.

D. gr. v.—gr. x. as a Narcotic. gr. v.—℈j. used as a Suppository.

LINIMENTUM SAPONIS, L. E. D. Soap Liniment. Opodeldoc.

Prep. L. Mix *Dist. water* f℥ij. with *Sp. of Rosemary* f℥xviij., then add *Hard Soap* ℥iiß., and *Camphor* ʒx. Macerate, frequently shaking them, until they are dissolved. (In the last L. P. the proportion of Soap was much too large, in consequence of which the Liniment was apt to congeal in the cold, or even to form a jelly at ordinary temperatures. To remedy this, *Soft Soap* was frequently substituted by druggists.)
E. Digest *Castile Soap* ℥v. in *Rect. Sp.* Oij. for 3 days; add *Camphor* ℥iiß., and *Vol. Oil of Rosemary* fʒvj., and agitate briskly.
D. Made with *Soap* ℥ij., *Camph.* ℥j., *Proof Spirit* f℥xvj.

Action. Uses. Stimulant Embrocation. A vehicle for Opium, &c.

LINIMENTUM OPII, L. E. D., contains Soap Liniment.

CERATUM SAPONIS COMPOSITUM, L. Compound Soap Cerate.

Prep. Boil powdered *Oxide of Lead* ℥xv. in *Vinegar* cong. i. over a slow fire, constantly stirring, until they unite, then add *Soap* ℥x. and boil as before till all the moisture is evaporated, then mix with these *Wax* ℥xiiß. dissolved in *Olive Oil* Oj.—Di-Acetate of Lead is first formed. The Soda then unites with the Acetic′, and the fatty acid of the Soap with the Oxide of Lead. The Oil and Wax give consistence to the compound. This is of a *soft* texture, but may be converted into *hard* cerate, or *Emp. Cerati Saponis*, simply by evaporating away all the vinegar. (*v.* P. J. iii. 36.)

Action. Uses. Mild application to Scrofulous and other sores. The *hard* Cerate is preferred by Dr. Houlton to keep under dressings *in situ.*

EMPLASTRUM SAPONIS, L. E. D. Soap Plaster.

Prep. L. Melt *Lead Plaster* ℔iij. over a slow fire; add *White Castile Soap* sliced ℔ß., and *Resin* ℥j., first liquified; then, constantly stirring, evaporate to a fit consistence.
D. Less Soap; no Resin.
Gum Plaster is added in the E. P., to obviate the tendency to crumble.

Action. Uses. Discutient. Gives support, and is little irritant.

Pharm. Prep. Linim. Opii (*Hard Soap.*) Linim. Terebinthinæ, L. (*Soft.*) Pil. Rhei Comp. Pil. Cambogiæ Comp. Pil. Scillæ Comp. Pil. Aloes c. Myrrhâ, L. Pil. Al. c. Sapone, L. Pil. Coloc., Co. L. D. Pil. Galb. Co. L. (All with *Soft Soap* in L. P.)

GLYCERINA, D. Glycerine. A sweet principle produced during saponification.

This compound has already been mentioned as the base of fats and fixed oils, which usually consist of Oleate, Margarate, and Stearate of Glycerine, combined together in various proportions.

Prep. To obtain it pure, the residuary liquor of a soap manufactory is evaporated, and treated with alcohol. This dissolves out the Glycerine. The Spirit is then evaporated off, the Glycerine diluted with water, and boiled with Anim. Charcoal. This must be repeated until all colour and odour are extracted. Or it may be made by evaporating the water left after making Emp. Plumbi, first passing through it a stream of H S to free it from lead.

When pure the Glycerine is a colourless limpid fluid, of an oily feel, but mixing with water in all proportions, and soluble in alcohol and ether. Its composition is $C_6\,H_7\,O_5+HO$. It has a sweet taste, whence its name. It has a sp. gr. of 1·26 or 1·27. It will not crystallize. When exposed to heat it first boils, and is then decomposed, giving off the pungent vapour of a volatile product called Acroleine.

Action. Uses. It is used only as an external application, having emollient properties. Cotton-wool, steeped in Glycerine, has been recommended as an application to a diseased tympanum in some cases of deafness. It is also applied to chapped hands and sores.

MANNA, L. E. D. Fraxinus Ornus, *Linn.*, and F. Rotundifolia *Lam.* Succus ex inciso cortice fusus, aere induratus, L. Concrete exudation, from these and other species, E. D. Flowering Ash, and Round-leaved Ash. *Diand. Monog.* Linn.

The name Manna seems to be derived from the Arabic *mun*, signifying the same thing. But as there are several other sweetish exudations *v.* (Manna, *Penny Cycl.*), it is difficult to determine when Manna was first known and used. There is uncertainty also respecting the species which yields European Manna. The Flowering Ash is the Fraxinus of the ancients, while the Common Ash is the Ornus of Virgil.

FRAXINUS ORNUS (*Ornus europea,* Persoon.), is a tree about 25 feet high, with leaves which are impari-pinnate, consisted of 7 to 9 stalked, oblong-acute, serrated leaflets, which are hairy at the base of the midrib on the under side. Buds velvety. Panicles dense, terminal, nodding. Calyx very small, 4-cleft. Corol divided to the base into linear segments, which are white and drooping. Pericarp a narrow elongated capsule, which does not dehisce, terminated by a flat and obtuse wing.—Hilly situations in South of Europe, especially Calabria and Apulia, also in Sicily.—Fl. Græca, i. t. 4. St. and Ch. 53.

F. ROTUNDIFOLIA, Lamarck (*O. rotundifolia,* Persoon.), has leaflets in 2-4 pairs, smooth, roundish or ovoid, obtusely serrated at the margin, and subsessile. Considered by some to be only a variety of the last. Grows in Calabria and the East.

Tenore asserts that Manna is yielded by this latter tree, which is generally cultivated on account of its Manna, and also by another species or variety named *F. garganica*. Prof. Gusson assured Messrs. Merat and De Lens that *F. rotundifolia* alone yielded Manna, and that this was frequently grafted on *F. Ornus*. Both this species and *F. rotundifolia* are natives of Calabria, Apulia, and Sicily; and it is from these places that we obtain our chief supplies of Manna. But other species of Fraxinus, and even *F. excelsior*, or the Common Ash, in the south of Europe, have been stated to yield Manna.

Manna is obtained chiefly by making incisions into the bark, and inserting leaves below them, in the middle of summer and in early autumn. The juice flows out as a clear liquid, and soon concretes on the stem and the leaves, as well as on straws stuck into them, forming stalactitical or *Flake Manna*. Some falls on leaves or into vessels placed for receiving it. Several kinds are known in commerce. *Manna in tears* is a pure kind, in bright and roundish white grains; but *Flake Manna* is chiefly valued and mostly met with in this country. It is obtained from Calabria and Sicily. It is in light and porous pieces, 5 or 6 inches in length, mostly stalactitical in nature, often hollowed on one side, of a pale yellowish-white colour, easily broken. The odour is faintish, the taste mawkishly sweet, followed by slight acridity. Its colour changes to a yellowish-red when long kept. Inferior kinds are in smaller pieces, irregular in form, soft and sticky, of a yellowish-red or brownish colour, of an unpleasant sweetness, and often intermixed with impurities. These are called *Manna in sorts*, *Fat Manna*, *Tolfa Manna*, &c. Another set of Mannas is produced in Syria, Persia, and Arabia (*v.* Manna, *Penny Cycl.*); but these are never met with in European commerce. Manna melts with heat, and burns with a bluish flame. When pure, it is soluble in 3 parts of cold and in its own weight of boiling water. It is also dissolved by Alcohol. Manna contains about 60 per cent. of a peculiar principle called *Mannite*,—Sugar, of which some is crystallizable (*Thenard*) and some uncrystallizable, a little Gum, and some yellow nauseous Extractive, or *Resin*, which is supposed to be the purgative principle. *Mannite* may be obtained in acicular 4-sided crystals, sweet, without smell, soluble in water, less so in Alcohol, incapable of undergoing fermentation.

Action. Uses. Laxative, acting without irritation, but least active when fresh; apt, however, to create flatulence. Dose ℥j.—℥ij.; or for children, to whom it is suited from its sweet taste, ʒj.—ʒij.

Pharm. Prep. Confectio Cassiæ, L. Syrupus Sennæ, L.

The Apocyneæ contain a few plants possessing active and useful properties; but none are officinal, as the *Strychneæ* are now referred to Loganiaceæ.

The Asclepiadeæ, closely allied to *Apocyneæ*, contain many plants which are possessed of useful medicinal virtues. *Cynanchum* (or *Solenostemma*) *Argel* has been already mentioned (p. 406) as employed to adulterate Senna. *Cynanchum*

Monspeliacum and *Periploca Secamone* are said to be used to adulterate Scammony. *Secamone emetica* and *Asclepias curassavica* are emetic. *Tylophora asthmatica* has been considered an efficient substitute for Ipecacuanha, and an excellent remedy in Dysentery. *Calotropis procera, aka* and *mudar* of the natives of India, has long been employed as an Alterative in Cutaneous affections, and even in incipient Leprosy. The author employed a variety named *C. Hamiltonii* by Dr. Wight, which is common in North-west India, and which the natives there employ medicinally for the same purposes as the former. He has prescribed the fresh bark of the root, dried and powdered, alone and successfully in incipient cases of Leprosy and in other Cutaneous affections, both in the Civil and the Military Hospital at Saharunpore.

The root of Hemidesmus Indicus, or Indian Sarsaparilla, is officinal in the D. P. It has for some time been used in India, of which country it is a native, under the name of *Country Sarsaparilla*, and it was declared by the medical officers of the Madras establishment to be an efficient substitute for true Sarsaparilla in the treatment of Scrofulous, Syphylitic, and Cutaneous affections. This root is in long dark corky pieces, divided by transverse fissures into rings. It has been imported into this country under the name of *Smilax aspera.*

A *Syrupus Hemidesmi* is officinal in the D. P., and made by infusing ℥iv. in Aq. dest. ferv. Oſs., and adding afterwards to the clear liquor twice its weight of sugar. *D.* f℥j.—f℥ſs.

Loganiaceæ, *Endlicher.* Loganiads.

This order may be briefly defined as Rubiaceæ with superior ovaries. They occur in hot parts of the world.

Sub-order I. Spigelieæ, *Meesm.*—Are sometimes united with *Gentianeæ*, but are more allied to *Rubiaceæ*. Their leaves are furnished with stipulæ. Flowers isomeric, æstivation of the corols valvate, capsules didymous, many-seeded. Seeds without wings. Embryo small; cotyledons little conspicuous.—Warm parts of the New World and in New Holland, with a few species in tropical Asia.

Spigelia, E. Spigelia Marylandica, *Linn.* The Root. Carolina Pink. Wormseed. Perennial Wormgrass. *Pentand. Monog.* Linn.

The virtues of this plant were discovered by the Cherokee Indians, and made known in Europe about a century since. Being now seldom used in England, it has been omitted from the L. and D. P.

Its active properties reside principally in the root, which consists of numerous slender wrinkled fibres, attached to a knotty head; of a brownish colour externally; having a faint smell, and a slightly bitter, not very disagreeable taste. As sold in the shops, the stalks and leaves are usually found attached to the roots. Analyzed by M. Feneulle, they yielded a Fixed and Volatile Oil, a little Resin, a Bitter extractive matter, supposed to be the active principle, with Mucilaginous and Saccharine matter, and some salts. The leaves afforded the same principles, but a less quantity of the Bitter principle.

Action. Uses. Anthelmintic. Much used in North America. In large doses it acts as an Irritant Cathartic, and in poisonous doses as a Narcotic. It may be given in powder gr. x.—gr. xx. to a child 3

or 4 years old; ℈j.—℈ij. to an adult; or of the infusion (℈iv. to boiling Aq. Oj.) f℈iv.—f℥j. may be given to a child. A quantity of Senna equal to the Spigelia is usually added, to ensure a Cathartic effect. (*Wood and Bache.*) The Root of *S. Anthelmia* is similarly employed in Guiana and the West Indies as a remedy for ascarides.

Sub-order II. STRYCHNEÆ. Flowers regular. Æstivation of the Corolla valvate. Embryo rather large. Trees or Shrubs.

Tribe 2. *Eustrychneœ.* Berry or Drupè 2-celled, many-seeded, or from abortion 1-celled, 1-seeded, seeds peltate, apterous.

NUX VOMICA, L. E. D. Strychnos Nux Vomica, Linn. Semen, L. The Seeds, E. D. Nux Vomica, or Koochla tree. *Pentand. Monog.* Linn.

Nux Vomica was early used as a medicine by the Hindoos. It is their *Koochla* tree (Sans. Culaka, and Kataka), and being a produce of India, its properties must have been investigated long before it could be known to foreign nations. It is the *Izarakee* of Persian works on Materia Medica, but there is doubt respecting its name in Avicenna. *Khanuk-al-kulb*, dog-killer, and *Faloos mahee*, fish-scale, are other Arabic names. But under the name of *Jouz-al-Kue*, or Emetic Nut, the author obtained in India the fruit of a Rubiaceous shrub. Dr. Pereira thinks that the *Nux Mechil* of Serapion is Nux Vomica; but in Persian works this name is applied to a Datura.

A moderate-sized tree, with a short crooked trunk. Branches irregular, the young ones long and flexuose, with smooth dark-grey bark. Wood white, close-grained, and bitter. Leaves opposite, with short petioles, oval, smooth, and shining, 3 to 5-nerved, differing in size. Flowers small, greenish-white, in terminal corymbs. Calyx 5-toothed. Corol funnel-shaped; limb 5-cleft, valvate. Stamens 5; filaments short, inserted over the bottom of the divisions of the calyx; anthers oblong, half exserted. Ovary 2-celled, with many ovules in each cell, attached to the thickened centre of the partition. Style equal to the corol in length. Stigma capitate. Berry round, smooth, about the size of an orange, covered with a smooth somewhat hard fragile shell, of a rich orange-colour when ripe, filled with a soft white gelatinous pulp, in which are immersed the seeds attached to a central placenta. Seeds peltate or shield-like, slightly hollowed on one side, convex on the other, about ¾ of an inch in diameter, and about 2 lines in thickness, thickly covered with silky ash-coloured hairs attached to a fibrous testa, which envelopes the kernel composed of horny bitter albumen, of the form of the seed and of the embryo imbedded in a hollow in its circumference.—Roxb. Corom. i. t. 4. A native of the Indian Archipelago and of the forests of the Peninsula of India, as well as of the Southern parts of the Bengal Presidency, as near Midnapore.—Esenb. and Eberm. 209. St. and Ch. 11. 52.

Lignum Colubrinum, supposed to be an antidote against the poison of venomous snakes, as well as a cure for intermittent fevers, is produced by other species, as *Strychnos ligustrina* and *S. Colubrina.* *S. Tieute* yields the *Upas tieute* and *Tjettek* of the Javanese, which is an aqueous extract of the bark. *S. toxifera* yields the *Woorali* or *Ourari* poison of Guyana. *S. pseudoquina* is employed in Brazil as a substitute for Cinchona Bark, and the seeds of *S. potatorum,* Roxb., *nirmulee* of the Hindoos, are employed by them to clear muddy water.

Strychnos Ignatia, usually considered as constituting a distinct genus, and called *Ignatia amava,* Linn. is however of most importance, as its seeds, called

St. Ignatius's beans, are frequently made to yield their Strychnia. They are ovate, triangular, of a reddish-grey colour, and about twenty of them contained in a pear-shaped fruit. They are produced in the Philippine islands, and have long been used in India, where they are called *Papeeta*, and are mentioned in the work called Taleef Sheref. They are intensely bitter, and contain a larger quantity of Strychnia than the Nux Vomica seeds.

The wood of the Nux Vomica tree is said by Dr. Christison to be often substituted for the above *Lignum Colubrinum*, or Snake-wood. The Bark is unfortunately sold in many shops in Calcutta under the name of *Rohun*, and thus substituted for the febrifuge bark of the *Rohuna tree*, or *Soymida febrifuga* (Beng. Disp. pp. 247 and 437), which was made known by Dr. Roxburgh, written on by Dr. Duncan in 1794, and introduced into the E. P. In this way probably it came to be introduced into England, and not being found saleable, was sent to Holland, and there sold and used as Angustura-bark (v. p. 372), supposed at one time to be the bark of Brucea ferruginea. In 1804, Dr. Ronbach of Hamburgh observed that it acted as a poison, and as several fatal cases occurred, it was in consequence prohibited from being used in many Continental states. From its composition Batka suspected that it was the bark of the Nux Vomica tree, or of some allied species. This Dr. Pereira confirmed by examining the specimens of Strychnos Nux Vomica in the East Indian Herbarium. (Med. Gaz. xix. p. 492.) Dr. Christison, as he informed the author, came to the same result by examining specimens of Nux Vomica bark along with French specimens of false Angustura Bark.

Dr. O'Shaughnessey, in Calcutta, fully established the identity of false Angustura bark, and of the bark of the Nux Vomica tree, in Journ. of Med. and Phys. Soc. of Calcutta, Jan. 1837; having been led to it by the circumstance of an alkali having been obtained from what was supposed to be the bark of the *Soymida febrifuga*, but which proved to be the bark of Strychnos Nux Vomica. The whole forms a most instructive lesson on the absolute necessity of being thoroughly acquainted with the true nature of the drugs we prescribe.

Nux Vomica Bark is in flattish or slightly curved pieces, thick, hard, and compact; fracture dull and brownish; epidermis sometimes displaying a ferruginous, spongy, and friable efflorescence, at other times a yellowish grey colour, marked with prominent greyish-white spots. Both appearances are due to alterations in the texture of the epidermis, and not to lichens, which are rare. The bark is smooth internally; its powder of a yellowish-white colour, without smell, but having an intense and permanent bitter taste. A drop of Nitric′ on the external ferruginous part, turns it of a dark-greenish colour; but if applied to a transverse section or internally, a dark-red spot is produced. Analysed by Pelletier and Caventou, it yielded Brucia. Dr. Christison states that it might also be employed for obtaining Strychnia. An infusion of the Bark slightly reddens Litmus, Nitric acid produces in it a red, and Sulphate of Iron a green colour, but an infusion of Galls a greyish-white precipitate.

Nux Vomica Seeds are round and flat, or rather shield-like, of a light-greyish colour, covered with a thick and tough testa, which is silky with fine hairs, which assist in detecting it when in powder and magnified. The seeds have little smell, but an intense and tenacious bitter taste; they are so tough, that the E. C. give directions for powdering them (*v.* Extract). The powder, apt to be adulterated with substances employed to assist in pulverization, is of a yellowish-fawn colour. Water takes up some, but Proof and Rectified Spirit nearly all its active properties. Analysed by Pelletier and Caventou, the seeds were found to contain two alkalis, *Strychnia* and *Brucia*, united with a peculiar acid, the *Igasuric* (called also Strychnic acid), a yellow Colouring matter, a Concrete Oil, Gum, Starch, Bassorine, and a small quantity of Wax.

Action. Uses. A powerful excitant of the spinal system of nerves. Poisonous, producing tetanic convulsions without affecting the brain. Used as a Stimulant of the Nervous System in Paralysis, in doses of the powder gr. v.—gr. xv.; or one of the following effective preparations may be employed.

EXTRACTUM NUCIS VOMICÆ, L. E. Extract of Nux Vomica.

Prep. L. Expose *Nux Vomica* ℥viij. to the influence of steam, that it may be softened. Bruise the same, cut into thin slices, and dry it; then macerate for 7 days in *Rect. Spirit* Oij. Press out and strain the tincture. Macerate the residue again in *Sp. Rect.* Oj. for 3 days, then express and strain. Let the greater part of the Spirit distil from the mixed tinctures, and evaporate the remainder to a fit consistence.

E. Similar: it may also be made by percolation. It is powdered by being first exposed in a proper vessel to steam until completely softened, then sliced, dried thoroughly, and immediately ground in a coffee-mill.

Action. Uses. A powerfully bitter-tasted extract. May be given in the form of pill in doses of gr. ß. gradually increased to gr. iij.

A *Tincture of Nux Vomica* may be made by macerating ℥ij. of the scraped seeds in *Rect. Spirit* f℥viij. for 7 days. As the active principles are extracted by spirit, it is an efficient preparation, and may be prescribed in doses of ♏v.—♏x.

STRYCHNIA, L. E. D. A crystalline alkaloid prepared from Nux Vomica. *Strychnine.*

Prep. Strychnia is placed in the Mat. Med. in the present L. P.

(L. P. 1836.) Take bruised *Nux Vomica* ℔ij. and boil it in *Rectified Spirit* Cj., in a retort fitted to a receiver, for 1 hour. Pour off the Spirit, and again and a third time boil with *Rectified Spirit,* each time Cj. and the Spirit recently distilled. Pour off the liquor. Press the *Nux Vomica,* and distil the Spirit from the mixed and strained liquors. Evaporate the residue to the consistence of an extract. Dissolve in cold water, and strain. Evaporate with a gentle heat to the consistence of syrup; while warm, add *Magnesia* gradually to saturation, shaking them together. Set aside for 2 days, then pour off the supernatant liquor. Press the residuum in cloth; boil it in *Spirit,* strain, and distil the Spirit. Add to the residue a very little *dil. Sul'* diluted with *Aq.* and macerate with a gentle heat. Set aside for 24 hours, that crystals may form. Press and dissolve them in water; then, frequently shaking, add *Ammonia,* to throw down the Strychnia.

Dissolve this in *boiling Spirit*, and set aside to form pure crystals.—In this process, the Igasurate of Strychnia is dissolved in the watery solution of the alcoholic extract. On the addition of the Magnesia, decomposition ensues, Igasurate of Magnesia is formed, and precipitated with the Strychnia, which is set free, along with some Brucia. These are then dissolved by the Spirit, and a Sulphate of Strychnia is formed on the addition of the Sul′. This Sulphate is decomposed by the Ammonia (a soluble Sulphate of Ammonia being formed), and comparatively pure Strychnia precipitated.

In the E. P. less Spirit is used. The Nux Vomica ℔j. is powdered (*v.* Extract); decoctions are then prepared with Aq. Ov. which necessarily contain the soluble Igasurates of Strychnia and Brucia; and these being evaporated to the consistence of Syrup, *Quicklime* ℥iß. is added in the form of Milk of Lime. The precipitate (Strychnia and Brucia, and Igasurate of Lime) is dried and powdered, and then boiled with successive portions of Rectified Spirit, when the Strychnia is dissolved, obtained by distilling off the Spirit, and purified by recrystallization, with or without animal charcoal.

D. In the formula of the D. C., water acidulated with Sulphuric acid is made use of to extract the Strychnia and Brucia. Lime is made use of as a precipitant. The remainder of the process is similar to that of the L. P., though anim. charcoal is used.

By these processes a powder of a greyish or of a brownish-white colour is obtained, which is obscurely crystalline, and, though impure, amounts only to about 0·4 per cent. of the seeds. (St. Ignatius' Bean yields about 1·2 per cent.) By the crystallization out of Spirit, the Strychnia, which is the least soluble of the two, is separated from the Brucia, which remains in solution.

Strychnia when pure is white, crystallized in brilliant oblique octohedrons, or in elongated four-sided prisms; or it may be in a simple granular state. It is so intensely bitter, that 1 part gives a perceptible taste to 60,000 parts of water. It is very insoluble, requiring about 7000 parts of temperate and 2,500 parts of boiling water, but is soluble in boiling Rectified Spirit, and in the fixed and volatile oils. But it is comparatively insoluble even in Alcohol and Ether. It may be extracted entirely from its dilute watery solution by boiling or simply digesting it with animal charcoal, which has a great affinity for it. It may be separated afterwards from the charcoal by means of alcohol. It is first fused by heat, and then decomposed. It is alkaline in its reaction on Litmus, and forms salts with acids, which are soluble and bitter. A white precipitate in solutions of these salts is produced by alkalis, and by Tannic acid. Gallic acid causes no change. Nitric acid colours it yellow; but if Brucia be present, a red colour is produced. Strychnia consists of $C_{44} H_{23} N_2 O_4$.

Tests. Strychnia is apt to be adulterated: that in common use is never pure. It consists of Strychnia, Brucia, and some colouring matter. It may contain the last in excess, as well as Lime and Magnesia. "Intensely bitter. Nit′ strongly reddens it. A solution of grs. x. in Aq. fℨiv. and *Pyroligneous acid* f℥j. when decomposed by concentrated *Sol. of Carbonate of Soda* f℥j. yields on brisk agitation a coherent mass, weighing when dry grs. x. and entirely soluble in Sol. of Oxalic acid." E. P. The precipitate should be equal to the Strychnia first employed. Lime or Magnesia will be insoluble in Oxal′.

"It dissolves in boiling Alcohol. It melts by heat, and if this be increased, it is totally dissipated. It is very bitter in taste. Being endowed with violent power, is to be cautiously administered." L.

If to a solution containing Strychnia be added, on a slab of white porcelain, a few drops of strong Sulph. acid, and then a little powdered Bichromate of Potash be dropped in at one point, a bluish or violet colour is immediately produced, which spreads through the liquid, passes gradually into a reddish yellow, and becomes finally brown. By this test $\frac{1}{1000}$th of a grain of the alkaloid may be detected. Strychnia is also said to produce a violet colour with a solution of Iodic acid; and it forms a white precip. with Bichlor. Mercury.

Brucia, which resembles Strychnia in many points, crystallizes in transparent crystals, or more usually in pearly scales. It is less bitter than Strychnia, and will dissolve in about 500 parts of water, and readily both in Alcohol and Rectified Spirit. It is alkaline, and forms crystallizable salts with acids. Nitric′ produces a deep-red colour when brought in contact with it; but the red solution becomes violet on adding a solution of Protochloride of Tin. The colour is destroyed on the addition of deoxidizing agents, as Sulphurous acid and Sulphuretted Hydrogen. It is composed of $C_{44}\ H_{25}\ N_2\ O_7$; the crystals contain 17 per cent. of water. Dr. Fuss, as quoted by Pereira, considers Brucia a compound of Strychnia and yellow Colouring matter. It may be employed for the same purposes as Strychnia, but is not above $\frac{1}{12}$ its strength; and may be given in gr. $\frac{1}{4}$—gr. v.

Action. Uses. Strychnia acts exactly as Nux Vomica, and may be employed for the same purposes, but only in doses of $\frac{1}{16}$ or $\frac{1}{20}$ of a grain, very gradually increased. The first effects experienced from medical doses are twitches in the muscles of the extremities, often during sleep, and frequently first in the paralysed part. Some improvement of the digestive functions is often experienced. But in larger doses, tetanic spasms ensue, and a tendency to lock-jaw, with transient intervals of relief. When the first twitches are experienced, it is necessary to intermit the use of the medicine, as the constitution does not become accustomed to its use, and some cases show a tendency to its being cumulative in its action. It is so powerful a Poison, that a girl 13 years of age was killed in about an hour by accidentally taking $\frac{3}{4}$ of a grain divided into three pills. (Edin. Med. Journal.)

Strychniæ Murias, D., is prepared by dissolving the alkaloid in dil. Hydrochlor. acid, and crystallizing by evaporation.

Gentianeæ, *Juss.* Gentianads.

The Gentianeæ are found in temperate and cold climates, often in mountainous situations. They are remarkable for the secretion of a bitter principle, which makes many of them useful as tonics.

1. *Gentianeæ veræ.* Corol twisted to the right in æstivation. Leaves opposite.
2. *Menyantheæ.* Corol plaited in æstivation. Leaves alternate. Marsh plants.

CENTAURIUM, E. Erythræa Centaurium, *Pers.* The Flowering-heads. Common Centaury. *Pentand. Monog.* Linn.

This is the *κενταύριον τὸ μίκρον*, or Small Centaury of Dioscorides.

This is a small herbaceous plant, with opposite leaves, upright stem, and a terminal corymb of pink flowers. It is common on English pastures, and flowers from June to August.

All parts of this plant possess a pure bitter taste, but the flowers in a less degree. It is suited for all the purposes for which the bitter tonics are indicated. It yields its properties both to water and to Spirit.

Action. Uses. Tonic; may be given in powder ʒß. or in infusion (ʒij.—ʒiv. in Aq. Oj.) in doses of f℥jß.

GENTIANA, L. E. D. Gentiana lutea, *Linn.* Radix; the Root. Yellow Gentian. *Pentandria Digynia,* Linn.

Gentiana is the Γεντιανή of the Greeks, called *juntiana* in the works of the Arabs.

Root thick, perpendicular, often forked, brown externally, yellowish within. Stem straight, 2 to 3 feet in height. Radical leaves ovate-oblong, 5-nerved; stem leaves sessile, ovate-acute; those supporting the flowers cordate, amplexicaul, concave, all of a pale glaucous-green colour. Flowers (Fig. 80) in an

Fig. 80.

interrupted spike of whorls, large, of a brilliant yellow. Calyx membranous, spathelike, 3 or 4-cleft. Corol rotate, with 5 or 6 green glands at its base, 5 or

6-parted, divided usually into 5 acute veiny lobes. Stamens 5; anthers straight, subulate. Style wanting. Stigmas 2, revolute. Ovary and capsule fusiform, 1-celled. Seeds roundish, compressed, with a membranous border.—A native of the Alps, Appenines, and Pyrenees, and other mountains of Europe.—Esenb. and Eberm. t. 199. St. and Ch. 132.

Other species also yield some of the Gentians of commerce, as the Alpine species, *G. purpurea, punctata,* and *pannonica;* while in the Himalayas *G. Kurroo* yields a similar product. *G. purpurea* is thought to yield the kind of root which is sometimes sold under the name *radix Gentianeœ rubrœ.*

The root, which is supplied from Germany and Switzerland, is the only officinal part. France is supplied from Auvergne, &c. It varies in dimensions, but is usually about the thickness of the thumb, and several inches in length; often a little twisted and wrinkled; of a brownish colour externally, yellowish within; rather soft, but tough; the odour feeble, but the taste at first slightly sweet, then of an intense but pure bitter. The properties are imparted readily to Water, Spirit, Wine, and Ether. The roots contain a bitter Extractive matter (*Gentianine*), Gum, Sugar, Pectine, Wax, Caoutchouc, a fixed Oil, Yellow Colouring matter, a trace of Volatile Oil, and an acid which has been named *Gentisic*,—which, when quite pure, is colourless, and in tasteless feebly acid crystals. Owing to the presence of Sugar, &c., Infusion of Gentian ferments with yeast, and yields a bitter distilled Spirit, prized by the Swiss and Tyrolese as a Stomachic.

Action. Uses. A Bitter Tonic; esteemed in Dyspepsia and in Convalescences. Like others of the same class, sometimes employed as an Antiperiodic and Anthelmintic.

D. Of the Powder gr. x.—gr. xxx. 3 or 4 times a day.

INFUSUM GENTIANÆ COMPOSITUM, L. D. Inf. Gentianæ, E. Compound Infusion of Gentian.

Prep. L. Macerate for 1 hour in a covered vessel *sliced Gentian* and *dried Orange Peel* āā ʒij., *Lemon Peel* ʒiv., in boiling *Aq. dest.* Oj. Strain.

E. D. Both twice as strong. The E. prep. contains Coriander, and adds 1-5th part of Proof Spirit. No Lemon Peel.

Action. Uses. Aromatic Tonic. Useful in Dyspepsia, &c., and as a vehicle for acids, &c., in doses of f℥jß.

MISTURA GENTIANÆ COMPOSITA, L. Compound Gentian Mixture.

Prep. Mix *Compound Infusion of Gentian* f℥xij. *Compound Infusion of Senna* f℥vj. and *Compound Tincture of Cardamoms* f℥ij.

Action. Uses. Aperient and Tonic. A good combination for extemporaneous use in doses of f℥jß. 2 or 3 times a day.

TINCTURA GENTIANÆ COMPOSITA, L. E. D. Compound Tincture of Gentian.

Prep. L. Macerate for 7 days *sliced Gentian* ℥iiß., *dried Orange Peel* ʒx., *bruised Cardamoms* ʒv., in *Proof Spirit* Oij. Strain. D. Similar.

E. contains *Canella* and *Cochineal,* but no *Cardamoms.*

Action. Uses. Tonic, Stomachic. Adjunct to bitter infusions in doses of ʒj.—fʒij.

EXTRACTUM GENTIANÆ, L. E. D. Extract of Gentian.

Prep. L. Macerate *sliced Gentian Root* ℔iij. for 12 hours in *Water* Oiv.; pour off and strain the liquor; add to the residue Oij. of *Water*, macerate for 6 hours, gently press out and strain the liquor; lastly, evaporate the mixed liquors to a fit consistence. D. Similar.

E. Prepared by percolation, also with cold water. Hot water would dissolve out Pectine and other inert matters from the root.

Action. Uses. Tonic in doses of gr. v.—℈j. in pills, often given with metallic salts.

VINUM GENTIANÆ, E. Compound Wine of Gentian.

Prep. Digest *Gentian* ʒiv., *Yellow Cinchona Bark* ℥j., *Bitter Orange Peel* ʒij., *Canella* ʒj., all coarsely powdered, in *Proof Spirit* f℥ivſs. for 24 hours, then add *Sherry Wine* f℥xxxvj. and digest for 7 days. Strain and express the residue strongly, and filter the liquor.

Action. Uses. A good Stomachic in doses of fʒiv.—f℥j.

CHIRETTA, E. D. Ophelia Chirata, *Griseb.* Herb and Root. (*Agathotes Chirayta*, Don. D.) Chiretta. *Tetrand. Monog.* Linn.

The bitter called *Chiretta*, or *Chiraeta*, is as universally employed throughout the Bengal Presidency as Gentian is in Europe. It has long been known to the Hindoos, but there is no reason to suppose it to be the *Calamus aromaticus* of the ancients. (*v.* Himal. Bot. p. 277.) The first English account is that of Dr. Fleming (in Asiat. Res. xi. p. 167), who referred it to the genus Gentiana, others to Swertia, and the late Prof. Don to Agathotes; Grisebach now refers it to Ophelia. It is often confounded with another powerful Indian bitter, that is, Creyat, or Justicia paniculata. But there are several plants closely allied to the Chiretta, which are used for the same purposes, as stated in Him. Bot. p. 277. Thus, *Ophelia* (*Swertia*, Wall.) *angustifolia*, Don, is so in Northern India, and called *puharee* (*i. e.* hill) *chiretta*, to distinguish it from the true or *dukhunee* (southern) *chiretta*. This is obtained from Nepal. *Exacum tetragonum* is called *ooda* (that is, purple) *chiretta*.

It is an annual, of from 2—3 feet high, with a single, straight, round, smooth stem. Branches generally decussated, nearly erect. Leaves opposite, amplexicaul, lanceolate-acute, smooth, 5—7-nerved. Flowers numerous, stalked, upper half of the plant forming elegant decussated umbel-like cymes, with 2 bracts at each division. Calyx 4-cleft, with sublanceolate persistent divisions, shorter than the corolla. Corol yellow, rotate, limb 4-parted, spreading, withering in æstivation, twisted to the right, with 2 glandular hollows protected by a fringed scale upon each segment. Stamens 4; filaments subulate, shortly connected at the base; anthers cloven at the base. Style single. Stigma large, 2-lobed. Capsules conical, rather shorter than the permanent calyx and corol, 1-celled, 2-valved, opening a little at the apex. Seeds numerous, affixed to two recepta-

cles adhering to the sides of the valves.—Himalaya mountains, of which Nepal is one of the valleys.—Wall, Pl. As. Rar. 3. p. 33. t. 252.

Chiretta is met with in a dried state, tied up in bundles, with its long slender stems of a brownish colour, having the roots attached, and which have been taken up when the plant was in flower. The whole plant is bitter. Mr. Battley states that it contains — 1. A free Acid. 2. A very Bitter Extractive and Resinous matter, and much Gum. 3. Muriate and Sulphate of Lime and of Potash. He considers that the Spirituous Extract is more aromatic than that of Gentiana lutea, but that the extractive and the gum are in larger proportion in the latter. Water and Spirit take up its active properties.

Action. Uses. Bitter Tonic; Stomachic in Dyspepsia, or as a Tonic in Convalescence; in either cold or hot infusion; the former is lighter, well suited to Dyspeptics, and not so apt to create nausea in a hot climate. Sometimes a little Orange-peel or Cardamom is added. The Tincture also may be used.

INFUSUM CHIRETTÆ, E. D. Infusion of Chiretta.

Prep. E. Infuse *Chiretta* ℨiv. in *boiling Aq.* Oj. for 2 hours, and strain.
D. Similar. A cold infusion, or one made with a temperature not exceeding 180°, is preferable. (*v.* Wall. *l. c.* p. 33.)

Action. Uses. Stomachic in doses of f℥iß.—f℥iij. to be taken before dinner, or twice a day.

TINCTURA CHIRETTÆ, D. Tincture of Chiretta.

Prep. Macerate for 14 days bruised *Chiretta* ℥v. in *Proof Spirit* Oij. Strain, express, and filter.
D. fʒj.—iij.

MENYANTHES, E. Menyanthes trifoliata, *Linn.* The Leaves. Buckbean or Marsh Trefoil. *Pentand Monog.* Linn.

The Buckbean, though long employed, is now but seldom used in European medicine.

A handsome herbaceous plant, floating on water, or growing in marshes, in England, Cashmere, and most parts of Europe and North America. It has large long-stalked ternate leaves, and a lilac-coloured raceme of flowers, with corollæ bearded internally.

The stem and leaves are smooth, with little odour, but have a very bitter, somewhat nauseous taste. The expressed juice contains, according to Trommsdorff, a very bitter azotized Extractive (*Menyanthine*), a brown Gum, Inuline, Green Fecula, Malate and Acetate of Potash, and about 75 per cent. of water. Water and Alcohol take up its active properties.

Action. Uses. A Bitter Tonic; in large doses, Cathartic and Emetic. Doses of the powdered leaves grs. xx., or of the Infusion (ℨiv. to Aq. Oj.) f℥iß. two or three times a day.

CONVOLVULACEÆ, *R. Brown.* Bindweeds.

The Convolvulaceæ are allied to Polemoniaceæ, Solaneæ, and Boragineæ. They abound in the plains and valleys of hot and tropical countries, some are found in the driest situations. The stems of many being annual, a few come to perfection in the summer of higher latitudes. Many are remarkable for the secretion of purgative principles, as in the Jalap, Scammony, Turpeth, *Ipomœa cærulea,* &c.

JALAPA, L. E. D. Exogonium Purga, *Benth.* (*Ipomœa Purga*, E.). Tuber, L. The Root, E. D. *Purga* of the natives of Jalapa. Jalap Root.

Jalap has been known in Europe since 1609, having been introduced into England from the Mexican town of Jalapa, whence it has its name. It was at one time supposed to be produced by *Mirabilis Jalapa*, and then by *Convolvulus Jalapa*, Linn., called also *Ipomœa macrorhiza*, Mich. But all these grow in hot countries, while the Jalap, as long since stated by Humboldt (New Spain, vol. iii. p. 36), or the true "*Purga de Xalapa*, delights only in a temperate climate, or rather an almost cold one, in shaded valleys, and on the slopes of mountains." The true Jalap plant seems to have been first sent from Mexico by Dr. Houston; at least, seed sent by him produced a plant which Miller has described in the 6th ed. of his Gardeners' Dict. as having smooth leaves, while the leaves of the other plant, or *Convolvulus* (now *Batatas*) *Jalapa*, are downy, especially on their under surface. In 1827, Dr. Coxe, Prof. of Mat. Med. in Pennsylvania, received from Xalapa several growing roots of the Jalap plant. Mr. Nuttal described them by the name of *Ipomœa Jalapa*, in Am. Journ. of Med. Sc. v. p. 300, Feb. 1830. Living roots were sent by Dr. Coxe to Dr. A. T. Thompson, and the description was inserted in his Dispensatory in 1831. The same plant is referred to by Mr. Don's MS. name in the L. P., 1836. About the same time, or a little later, Ledanois sent the root to Paris; and Scheide, travelling in Mexico, collected at Chiconquiera on the eastern declivity of the Mexican Andes, at an elevation of 6000 feet, living plants and seeds of the true Jalap, and sent them to Germany, where they were cultivated and the plant named *Ipomœa Purga* by Wenderoth, Nees, Off. Pfl. Suppl. iii. t. 16, *I. Scheideana* by Zuccarini, Plant. Nov. fasc. i. t. 12, *I. officinalis* by G. Pelletan in France, and *Exogonium Purga* by Mr. Bentham. Dr. Lindley says, "From an unpublished letter in the possession of the Horticultural Society of London, from Don Juan de Orbegozo, a pupil of Cervantes, residing at Orezaba, it appears certain that this plant furnishes the Jalap of commerce." The plant is now cultivated in the open air on the Continent, at the gardens of the Horticultural Society, and that of the Society of Apothecaries. The author, by the liberality of the Hort. Soc., and of Dr. Balfour, has been enabled to send roots to the Himalayas, where he hopes it will soon be established.

Exogonium (or *Ipomœa*) *Purga* (Fig. 81). The true Jalap plant has a tuberous, fleshy root-stock, with numerous pear-shaped tubers, externally brownish coloured, internally white, with numerous long fibres. The stem, climbing to a great extent, is of a brownish colour, round and smooth, without downiness. Leaves on long foot-stalks, cordate, with a tendency to become hastate in the lower leaves, deeply sinuated at the base and acuminate at the apex, entire, very smooth. Peduncles axillary, 2-flowered, commonly only one blown at a time. Calyx without bracts; sepals 5, obtuse, mucronate, with 2 of them external. Corolla of a crimson or a light-red colour, with a long rather clavate tube, four times longer than the calyx; limb undulated, with five plaits; lobes obtuse, subemarginate. Stamens five; filaments smooth, unequal, longer than the tube of the corol, with white, linear, exserted anthers. Stigma capitate, deeply furrowed. Capsule 2-celled; cells 2-seeded. — On the eastern declivity of the Andes of Mexico, at an elevation of about 6000 feet, where the climate is rainy but subject to frost in winter. Flowers in August and September. The tubers are gathered chiefly in the spring, when the young shoots are springing.—Nees & Eberm. Sup. 3. t. 13. Zuccarini, Plant. Nov. Fasc. 1. t. 12.

Fig. 81.

Ipomœa Mestilantica, Choisy. Dec. Prod. ix. 389, *I. orizabensis* of Pelletan, is another plant, closely allied to the former, and grows in the temperate parts of the state of Oaxaca. Dr. Lindley (Fl. Med. p. 397) supposes that it may be the *Convolvulus orizabensis* of Pelletan, which Dr. Scheide had heard of under its Spanish name of *Jalapa Macho* or *Purga Macho*, or Male Jalap; but he had only seen the root, which appears very like of *E. Purga*. Don J. de Orbegazo, as quoted by Dr. L., states that this is considered by the traders in Jalap to be extremely similar in quality, and as "it is the more abundant and larger of the two, at least in some districts," the probability is that it also forms a part of the imported samples of this drug. —Bot. Reg. 1841. t. 36. Dr. Pereira states that this plant yields an inferior kind called *light, fusiform,* or *male* Jalap.

Jalap tubers vary in size from a walnut to an orange; are usually pear-shaped or turnip-shaped, having often projecting from them smaller horn-shaped tubercles; the surface being smooth, corrugated, or marked with slight furrows. The colour externally is blackish-grey.

They are heavy and compact, with a brownish fracture, a very peculiar nauseous odour, and an acrid pungent taste. The larger tubers are sometimes divided into halves, quarters, or disks, and are always marked with circular or vertical incisions, made to facilitate their drying. When cut transversely, the section, if polished, appears very compact, and has the appearance of a deep-coloured wood, with still darker concentric circles, and many shining lines and points. The odour of Jalap, when cut or powdered, is strong and irritating. The powder is of a pale brownish colour.

Several adulterations are met with, especially in continental commerce, as the roots of the above *Ipomœa orizabensis*, called Stalk or Light Jalap, but by Guibourt *Jalap fusiform;* also a *False Jalap with a rose odour;* also the smaller roots of *Batatas Jalapa* of Choisy, (*Convolvulus macrorhizus* and *Jalapa* of authors.) Roots of a *Bryonia*, of a *Smilax*, and of *Mirabilis*, are sometimes intermixed.

Lately analysed by Guibourt, who did not attempt to ascertain all the salts and principles, Jalap was found to contain of Resin 17·65 per cent., a liquid Sugar, obtained by Alcohol, containing some of the deliquescent salts, 19·00, Brown Saccharine extract, obtained by water, 9·05, Gum 10·12, Starch 18·78, Woody matter, 21·60, loss being 3·80 =100. This, as M. G. remarks, differs from the analyses hitherto given, but the presence of Sugar, which he supposes to be of the nature of Cane Sugar, approximates Jalap to Batatas and other Jalap (as Rose Jalap) roots of the same family, which contain it. The Cathartic properties depend on the Resin: hence Rectified Spirit is the best solvent. Water takes up the Gum and Starch, with little of the active principle. Though Jalap is apt to be attacked by insects, its virtues are not in consequence impaired, for they leave untouched the resinous part. This Resin is of a greyish colour, opaque, brittle, acrid in taste, soluble in Alcohol, a little so in Ether, readily so in Nit′ or Ac′, and in solution of Potash. It is now often adulterated with Guaiacum, which may be detected by the blue colour produced by Nitrous gas, and by being soluble in Ether, which does not dissolve pure Resin of Jalap. Dr. Kayser has named this *Rhodoretine*, from its producing a red colour with strong Sul′. He considers it composed of $C_{42}H_{35}O_{20}$. The presence of a peculiar acid, called *Jalapic*, analogous to the fatty acids, has been indicated by some.

The *Pulvis Jalapæ* of druggists is said to be extensively adulterated with the sawdust of *Guaiacum wood.*

PULVIS JALAPÆ COMPOSITUS, L. E. D. Comp. Jalap Powder.

Prep. L. Rub separately into very fine powder *Jalap* ℥iij., *Bitartrate of Potash* ℥vj., *Ginger* ʒij. Mix. E. D. Similar: the E. C. orders no Ginger.

Action. Uses. Hydragogue Cathartic; useful in habitual Costiveness, &c. in doses of ℈j.—ʒj.

TINCTURA JALAPÆ, L. E. D. Tincture of Jalap.

Prep. L. Macerate for 7 days *powdered root of Jalap* ℥v. in *Proof Spirit* Oij. Strain.

E. ℥vij. to Oij.; may be made by digestion, or percolation, as Tinct. Cinchonæ. D. ℥vi. to Oij.

Contains the Resin of Jalap, with some of the principles soluble in water.

Action. Uses. Cathartic adjunct to Purgative draughts, in doses of fℨj.—fℨij.

EXTRACTUM JALAPÆ, L. Ext. sive Resina Jalapæ, E. Extract or Resin of Jalap.

Prep. L. Macerate *bruised Jalap root* ℔ijß. in *Rectified Spirit* Cj. for four days. Pour off the Tincture. Boil the residue in *Aq. dest.* Cij. to Cß. Strain the liquors, evaporate the decoction, and distil the Tincture till thick; then mix the Extract and the resin, and evaporate to the proper consistence. The Extract must be kept *soft* for pills and *hard* for powder.

E. "Take finely powdered *Jalap,* moisten with *Rectified Spirit:* in 12 hours put it into the percolator and exhaust with Rectified Spirit. Distil off the greater part of the Spirit, and concentrate the rest to a due consistence over the vapour-bath."—As the active properties of Jalap depend upon its resinous and not upon its saccharine, gummy, or amylaceous principles, this preparation is preferable to that of the L. P., where the extracts of water and of spirit are mixed together, and the produce necessarily weaker than the Resin.

Action. Uses. Cathartic, in doses of gr. v.—℈j. Usually prescribed in combination. The Resin of the E. D. in doses of gr. iij.—gr. xij.

SCAMMONIUM, L. E. D. Convolvulus Scammonia, Linn. Gummi Resina e resectâ radice emissa, L. Gummy-Resinous Exudation from incisions into the root, E. D. Scammony.

Scammony has been employed in medicine since the time of Hippocrates. It is called *suk moonya* by the Arabs. Several varieties may be met with in commerce.

The Scammony Convolvulus has perennial tapering roots from 3 to 4 feet long and from 9 to 12 inches in circumference, fleshy, and abounding in acrid milky juice. Stems numerous, annual, round, slender, smooth, twining over neighbouring plants, and to a great extent over the ground. Leaves petioled, quite smooth, entire, oblong, arrow-shaped, acute, truncate, and angular at the base, with acute spreading lobes. Peduncles axillary, solitary, 3-flowered, about twice the length of the leaves. Sepals rather lax, smooth, ovate-obtuse, with a reflexed point. Corol campanulate, much expanded, of a pale sulphur-yellow colour, three times as long as the calyx. Stamens 5, erect, converging, about a third of the length of the corol. Style equal to the stamens. Stigmas white, oblong, erect, parallel, distant. Ovary 2-celled, 4-seeded. Capsule 2-celled.—Common in Greece and the Levant.—Esenb. and Eberm. 195.

A Convolvulus, which is also called *C. Scammonia,* found by Capt. D'Urville in the island of Cos, having yellow flowers with reddish bands (Fl. Med. t. 317), is supposed to yield Scammony. Tourneforte informs us that an inferior Scammony is obtained in Natolia, whence it is sent to Smyrna, and hence called Smyrna Scammony. Sibthorp says that Scammony is produced by two different species of Convolvulus, one the above *C. Scammonia,* and the other (perhaps *C. hirsutus*) has been supposed to be *C. farinosus,* Linn.; but, as Dr. Lindley justly observes, this is a Madeira plant, and has probably nothing to do with producing Scammony

The root-stock of the Scammony Convolvulus was found by Dr. Russel to be a mild Cathartic. Scammony is the juice of the fresh root obtained by cutting the top obliquely off, and allowing the milky juice which exudes to be collected in shells or other vessels placed at the lowest part. The whole collected is allowed to dry in any convenient receptacle, and constitutes what is called *Virgin Scammony*, but this is very seldom to be met with in so pure a state. The greater part of that met with in English commerce is imported from Smyrna. The best accounts have been given by Drs. Pereira and Christison.

Scammony is usually in shapeless lumps, rubbed and of a dull ash-grey colour externally; the fracture is conchoidal, and, when it is fresh, displays a glistening resinous lustre, of a pale, soon passing to a dark greenish-black colour, something like Guaiacum; a small splinter is grey and somewhat transparent; Sp. Gr. 1·2; the whole is brittle, easily pulverized; and the powder of an ash-grey colour. The odour is faint, but peculiar, more perceptible if breathed upon, sometimes compared with that of old cheese; taste slight, but acrid. It should burn away without leaving much ash; form an emulsion with water, and dissolve almost entirely in boiling Alcohol, while Ether will take up from 75 to 82 parts of Resin. Dr. Christison gives as the constituents of two distinct specimens of old Scammony, Resin 81·8 and 83·0, Gum 6·0 and 8·0, Starch 1·0 and 0·0, Fibre and Sand 3·5 and 3·2, water 7·7 and 7·2. Hence it is a Gum-resin, with only a small proportion of Gum.

The Resin has a feeble Scammony odour and taste, and a dirty greenish-brown colour; but when purified, it is of a pale wine-yellow colour, and is free from both taste and smell. Its powder forms with milk a fine uniform emulsion. It is soluble in Ether.

The less pure kinds of Scammony, which are also the more common, and enumerated by Dr. Pereira as the *seconds* and *thirds* of commerce, are distinguished by their greater weight, less resinous, rather dull fracture; by their greyish, sometimes blackish colour, frequently with glimmering or whitish spots; also by their form, being sometimes that of the vessel in which they have been packed, sometimes in flattish cakes, at other times in amorphous spongiform masses. Some effervesce with H Cl from being adulterated with Chalk; others, from containing Starch, are affected by Tincture of Iodine. (*v.* Tests.)

Tests. While yet in a soft state, it is said to have often mixed with it the expressed juice of the stalks and leaves, also flour, ashes, and sand. Dr. Pereira enumerates chalk, amylaceous matter, sand, and guaiacum, as impurities; and tragacanth has been found in some specimens. E. P. "Fracture glistening, almost resinous if the specimen be old and dry. Muriatic acid does not cause effervescence on its surface (if no chalk has been added). The decoction of its powder, filtered and cooled, is not rendered blue by Tincture of Iodine (showing the absence of Starch). Sulphuric Ether separates at least (75 to) 80 per cent. of Resin dried at 280°." Some of the masses appear to

have been rolled in chalk, but do not contain any in their substance. Guaiacum may be detected by the action of Nitrous gas, and sand and chalk are found in the ashes after incineration.

Action. Uses. A Drastic Cathartic. Useful on account of the small doses in which it can be prescribed; as for an adult, gr. x.—gr. xv.; but if pure or Virgin Scammony be used, gr. v.—gr. x. will suffice. It is usually given in combination with Rhubarb or Calomel, or in the following preparations; sometimes in biscuits.

Pharm. Prep. Pil. Colocynthidis Comp., L. E. D.

Pulvis Scammonii compositus, L. E. D. Comp. Scammony Powder.

Prep. L. Rub up separately into very fine powder *Scammony* and *hard Extract of Jalap* āā ℥ij, *Ginger* ℥ß. Mix.
E. *Scammony* and *Bitart. Pot.* āā.
D. *Scammony* ℥j., *Comp. Jalap Powder* ℥iij.

Action. Uses. Cathartic. May be given in doses of gr. x.—ʒß.

Confectio Scammonii, L. D. Scammony Confection.

Prep. L. Rub into fine powder *powdered Scammony* ℥iß., *bruised Cloves* and *Ginger* āā ʒvj. When the Confection is to be used add *Syrup of Roses* q. s. and *Oil of Caraway* fʒß. Mix well together.
D. Same proportion of Scammony, &c.

Action. Uses. Stimulating Cathartic in doses of ℈j.—ʒj.

Extractum sive Resina Scammonii, E. Scammony Resin.

Prep. Take *Scammony* q. s. in fine powder; boil it in successive portions of Proof Spirit till the Spirit ceases to dissolve anything; filter; distil the liquid till little but water passes over. Then pour away the watery solution from the resin at the bottom; agitate the resin with successive portions of boiling water till it is well washed; and, lastly, dry it at a temperature not above 240°.

Action. Uses. Active Cathartic in doses of gr. v.—gr. x. with some bland fluid, such as milk.* Good Scammony contains at least 80 per cent. of this Resin. Mr. Bell finds that Alcohol dissolves 80 grains (resin), and Proof Spirit 90 (resin and watery extractive), out of 100 gr. of a good sample of scammony.

Mistura Scammonii, E. Scammony Emulsion.

Prep. Triturate *Resin of Scammony* grs. vij. by degrees with *unskimmed Milk* f℥iij. till a uniform emulsion is obtained.

Action. Uses. Cathartic Emulsion, without any disagreeable taste.

* The Resin of Scammony is sometimes adulterated with the cheaper Resins of Guaiacum, Jalap, and Colophony. Resin of Jalap is recognized by its insolubility in pure ether. Resin of Guaiacum may be detected by turning blue with Nitrous acid gas. Colophony may be dissolved out by Oil of Turpentine, or discovered by the deep red colour produced on trituration with strong Sulph. acid. (Thorel.)

LABIATÆ, *Juss.* Labiates.

The Labiatæ are most closely allied to *Verbenaceæ* and to *Boragineæ*, more remotely to *Scrophularineæ*. They are found in most parts, but more numerously in the Old than in the New World, and most abundantly in temperate climates. They abound in volatile oil, usually containing Stearoptene, often also a little bitter and astringent principle.

Tribe *Menthoideæ*. Corolla nearly regular. Stamens distant, straight.

LAVANDULA, E. D. Lavandula vera, *Dec.* Flowering Heads. Common Lavender.

It is unknown when Lavender was first employed in medicine.

LAVANDULA VERA forms a branched shrub, about 4 feet high. Leaves oblong, linear or lanceolate, entire, when young hoary, revolute at the edges. Spikes interrupted. Whorls of 6 to 10 flowers. Floral-leaves rhomboid-ovate, acuminate, membranous, all fertile, the uppermost shorter than the calyx. Bracts scarcely any. Flowers purplish-grey. Calyx tubular, nearly equal, shortly 5-toothed, 13- or rarely 15-ribbed. Corol, upper lip 2-lobed, lower 3-lobed; all the divisions nearly equal; the throat somewhat dilated. Stamens didynamous, declinate. Filaments smooth, distinct, not toothed. Anthers reniform, 1-celled. Ovary and fruit as in the order.—A native of barren hills in Europe, extending to the north of Africa. Cultivated in gardens; extensively at Mitcham, in Surrey. Tops collected in June and July.—Esenb. and Eberm. t. 178.

LAVANDULA SPICA, *Dec.* French Lavender, sometimes called *L. latifolia*, is a distinct species from *L. vera*, but indigenous in the same countries. It may easily be distinguished by its leaves being broader and somewhat obovate or spathulate. Its odour is not so agreeable as that of Common Lavender, though more powerful.—Esenb. and Eberm. 179 as *L. latifolia*.

Lavender flowers, or rather tops, as usually dried, are well known by their spike-like appearance, greyish *lavender* colour, grateful fragrant odour, and warm bitterish taste. The properties depend chiefly on the presence of Volatile Oil.

Action. Uses. Stimulant, Carminative. The flowers are not officinal in the L. P.

OLEUM LAVANDULÆ, L. E. D. (English) Oil of Lavender.

Prepared from Lavender Flowers distilled with water, as other volatile oils.

This Oil is of a light yellow colour, has a very grateful odour, and a pungent taste. Sp. Gr. 0·87 to 0·94. It consists of a fluid volatile oil, holding in solution a camphor-like substance, which has been called *Stearoptene.* It is soluble in Rectified Spirit, and in two parts of Proof Spirit. Like several other volatile oils, it will absorb Oxygen, and become acid. This Oil is apt to be mixed with the Oil of French Lavender, commonly called *Oil of Spike*, which is a powerful but less agreeable oil. Both species are mentioned by the L. P., as producing the oil.

Action. Uses. Stimulant, Carminative, in doses of ♏v.—♏x.

SPIRITUS LAVANDULÆ, E. Spirit of Lavender.

Prep. Mix *fresh Lavender flowers* ℔ijß. with *Rectified Spirit* Cj., and with the heat of a vapour-bath distil over Ovij.

Action. Uses. The Volatile Oil rises with and is dissolved in the Spirit: hence this is sometimes prepared by dissolving the Oil in Rectified Spirit. It approaches in nature the so-called *Lavender Water* of the shops, which however contains also other volatile oils dissolved in Spirit.

TINCTURA LAVANDULÆ COMPOSITA, L. D. Spiritus, E. Compound Tincture or Spirit of Lavender. *Lavender Drops.*

Prep. L. Macerate for 7 days bruised *Cinnamon* and bruised *Nutmeg* āā ℥ijß. *Red Sandal Wood Shavings* ℥v. in *Rect. Spirit* Oij. Then press and strain; and dissolve in the Tincture *Oil of Lavender* f℥iß., and *Oil of Rosemary* ♏x.
E. *Cloves* are added. D. *Cochineal* is substituted for *Sandal wood.*

Action. Uses. This compound Tincture contains the Volatile Oil of Lavender, and that of the other aromatics used, dissolved in Spirit and coloured by the Red Sandal Wood. It is Stimulant and Cordial; is used in Hysterical cases and in Flatulent Colic in doses of ♏xv.—f℥ij.

MENTHA, *Linn.* Mint.

Calyx nearly equal, 5-toothed. Corol with the tube inclosed; limb nearly equal, 4-cleft, the upper segment broader. Stamens 4, equal; anthers with 2 parallel cells. Stigmas at the points of the bifid style. Fruit dry, smooth.

Several of the Mints, remarkable for their odour and taste, have long been used in medicine (*μίνθα*, Ἡδυοσμὸς and Καλὰ *μίνθα* of the Greeks, *nana* of the Arabs), and some as sweet herbs; but it is difficult to distinguish one species from another by the short descriptions given.

MENTHA VIRIDIS, L. E. D. The whole Herb. Spearmint.

Spearmint has long been employed in medicine.

Root creeping. Stem smooth, erect. Leaves sessile, lanceolate, acute, unequally serrated, glabrous, glandular below, those under the flowers bractlike, these and the calyxes hairy or smooth. Spikes linear-cylindrical; bracts subulate. Whorls approximated, or the lowest or all of them distant. Corol glabrous. Stamens rather long.—Marshy places in the milder parts of Europe, introduced into many parts of the world. Collected when about to flower.—E. B. 2424. Esenb. and Eberm. 166.

This plant has an agreeable odour, and a pleasant aromatic taste, with some bitterness.
Action. Uses. Stimulant and Carminative.

OLEUM MENTHÆ VIRIDIS, L. E. D. Oil of Spearmint.

Prep. Distil the flowering herb with Aq. as for other volatile oils.

Action. Uses. Pale yellow in colour, becoming reddish by age, of a strong, rather grateful odour, and pungent taste, followed by a sensation of coolness, giving its properties to the plant (of which it forms about 1-500th part), and also to the preparations. Stimulant, Carminative, in doses of ♏ij.—♏x.

INFUSUM MENTHÆ VIRIDIS, D. Infusion of Spearmint.

Prep. Take dried leaves of *Mentha viridis* ℥ß., pour on boiling *Aq.* Oß., and strain off by measure ℥viij.

Action. Uses. Stomachic and Carminative: given in doses of f℥iß. every 2 or 3 hours. Useful to allay sickness.

ESSENTIA MENTHÆ VIRIDIS, D. Essence of Spearmint.

Prep. As Essentia Carui, &c.

AQUA MENTHÆ VIRIDIS, L. E. D. Spearmint Water.

Prep. L. As Aq. Menth. Pip.
E. Mix *Fresh Spearmint* ℔iv., or *dry* ℔ij., with *Aq.* Cij. and *Sp. Rect.* f℥iij. Distil off Cj.
D. As Aqua Anisi.

Action. Uses. Carminative, and used as a vehicle in doses of f℥iß.

SPIRITUS MENTHÆ VIRIDIS, L. Spirit of Spearmint.

Prep. Prepare as Spiritus Menth. Pip. L.

Action. Uses. Stimulant adjunct in doses of f℈ß.—f℈ij.

MENTHA PIPERITA, L. E. D. *Linn.* The whole Herb. Peppermint.

Peppermint seems to have been introduced into practice in this country in the last century.

Root creeping. Stem procumbent, ascending, smooth, or with a very few spreading hairs. Leaves stalked, ovate, lanceolate, acute, rounded at the base, smooth, serrated, floral leaves smaller, lanceolate. Spikes lax, the uppermost whorls collected into a short obtuse spike, the lower ones removed from each other. Calyx tubular, glabrous below, with lanceolate subulate teeth.—Watery places in England, and also in other parts of Europe.—Cultivated at Mitcham, and collected when the flowers begin to blow. Flowers from July to September. —Esenb. and Eberm. 165. E. B. 687. St. and Ch. 45.

Peppermint is remarkable for its diffusive aromatic odour, and its warm but agreeable taste, feeling at first warm, but afterwards cool. Its properties depend on a Volatile Oil, a Bitter principle, and some Tannin; these are taken up by Spirit, and to some extent by water. It may be prescribed in the form of its Oil or Spirit, or in its distilled Water, or Infusion.

Action. Uses. Stimulant, Carminative. Much used in Flatulent Colic, &c., or where a diffusible Stimulant is indicated; or a medium required to counteract nausea or griping; or to cover the taste of other Medicines.

Oleum Menthæ Piperitæ, L. E. D. Oil of Peppermint.

Prep. Distil the fresh or dry herb with water, as above.

Peppermint Oil, obtained in the proportion of about a 200th part, is at first colourless, but soon becomes of a pale greenish-yellow colour, and of a deeper colour with age, has a fragrant penetrating odour, and a pungent but cooling taste. Sp. Gr. 0·902. Boils at 365°. At a temperature of — 12°, or by spontaneous evaporation, or pressure, white needle-like crystals of Stearoptene are obtained. From some kinds of Oil from North America and from Canton, this Stearoptene separates spontaneously. This Oil is said to be composed of C_{12} H_{10} O, and its Stearoptene of C_{10} H_{10} O. According to Walter, these numbers should be doubled.

Action. Uses. Stimulant, Carminative, in doses of ♏ij.—♏v. on a piece of Sugar.

Essentia Menthæ Piperitæ, D. Essence of Peppermint.

Prep. As Essentia Carui, D.

Aqua Menthæ Piperitæ, L. E. D. Peppermint Water.

Prep. L. Take dried *Mentha Piperita* ℔ij., or *fresh* ℔iv., *Aq.* Cij. Distil Cj., or prepare as Aq. Anethi.
E. As Aq. Menth. Vir. D. As Aq. Anisi.

Action. Uses. Carminative. Much used as a vehicle for other medicines in doses of f℥j.—f℥iij.

Spiritus Menthæ Piperitæ, L. E. Spirit of Peppermint.

Prep. L. Dissolve *Oil of Peppermint* ʒiij. in *Proof Spirit* Cj.
E. Take of Peppermint fresh ℔jß. Proceed as for Spirit of Caraway.

Action. Uses. Stimulant in doses of fʒß.—fʒij.

Mentha Pulegium, *Linn.* L. E. D. The Herb Pennyroyal.

Supposed to have been the Γλήχων of the Greeks and the Pulegium of Pliny.

Creeping root. Stem much branched, prostrate, rooting. Leaves about half an inch long, stalked, ovate, or elliptical, crenate, upper ones smaller, all with pellucid dots, a little hairy. Whorls sessile, all remote, globose, many-flowered. Calyx hispid, tubular, bilabiate, villous in the inside of the throat. Corols of a light purple.—Wet places in many parts of Europe. Collected when beginning to flower.—E. B. 1026. Esenb. and Eberm. 167. St. and Ch. i. 45.

The whole herb has a powerful fragrant odour, aud warm, aromatic, as well as bitter taste. Its properties depend on Volatile Oil and Tannin, and are very similar to those of other species of Mint.

Oleum Menthæ Pulegii, L. E. D. Oil of Pennyroyal.

Obtained by distilling the herb with water.

Action. Uses. Stimulant, Carminative, in doses of ♏ij.—♏v.

ESSENTIA MENTHÆ PULEGII, D. Essence of Pennyroyal.
Prep. As Essentia Carui, D.

AQUA PULEGII, L. E. D.
Prep. L. As Aq. Menth. Pip. E. As Aq. Menth. Vir. D. As Aq. Carui.

SPIRITUS PULEGII, L. Spirit of Pennyroyal.
Prep. L. Dissolve *Oil of Pennyroyal* ℥iij. in *Proof Spirit* Cj.

Action. Uses. These preparations are applicable to the same purposes and in the same doses as the preparations of Mint and of Peppermint.

Tribe *Monardeæ.* Corolla 2-lipped. Stamens 2, fertile, parallel under the upper lip.

The tribe *Monardeæ* contains SALVIA OFFICINALIS, *Linn.*, or Garden Sage, which has been employed in medicine from the times of the Greeks, and is no doubt as useful as any of the other Labiatæ for many of the same purposes. It is pungent and aromatic, and its Oil contains Stearoptene, while the plant abounds also in Bitter principle.

ROSMARINUS OFFICINALIS, *Linn.* E. D. The Tops, E. D. Common Rosemary. *Diandria Monog.* Linn.

Rosemary was called *Libanotis coronaria*, which the Arabs translated *akleel-al-jibbul*, or the Mountain Crown.

A very leafy shrub, 5—6 feet high. Leaves sessile, elongated, narrow, revolute at the margin, hoary beneath. Flowers few, in short, axillary, subsessile, opposite racemes, forming altogether a kind of spike. Floral leaves shorter than the purplish calyx, which is 2-lipped, the upper entire, the lower bifid. Corol of a greyish-blue or lavender-colour, not ringed in the inside, somewhat inflated in the throat, upper lip emarginate, the lower trifid, with the middle lobe larger, concave, and hanging down. Filaments shortly toothed near the base: anthers linear, with two divaricating confluent cells. Upper lobe of style very short.—Rocky hills of the south of Europe, Asia Minor, and Syria.—Flora Græca, t. 14. St. and Ch. i. 24.

Rosemary-tops should be collected when coming into flower. They have a powerful odour, a warm and bitter, slightly astringent taste. Their properties depend on Volatile Oil, Bitter principle, and Tannin. The tops are not officinal in the L. P.

Action. Uses. Stimulant, Carminative. Supposed to be useful in preserving the hair. Much employed as an ingredient in some perfumes, as Hungary Water and Eau de Cologne. "The admired flavour of Narbonne Honey is ascribed to the bees feeding on the flowers of this plant." *Lindl.*

OLEUM ROSMARINI, L. E. D. (*Anglicum,* L.) Oil of Rosemary.
Distil Rosemary-tops with water.

The Oil of Rosemary is obtained in the proportion of 4 or 5 ounces from a cwt. of the herb: sometimes scarcely any is yielded. (P. J.

ii. 516.) It is colourless, having all the properties of the plant. Sp. Gr. 0·88. The imported Oil is usually very impure,

Action. Uses. Stimulant, chiefly applied externally, and used as an ingredient of perfumes. Used in Tinct. Lavandulæ Co., L.

ESSENTIA ROSMARINI, D. Essence of Rosemary.

Prep. As Essentia Carui, &c.

SPIRITUS ROSMARINI, L. E. Spirit of Rosemary.

Prep. L. Dissolve *Oil of Rosemary* f℥ij. in *Sp. Rect.* Cj.
E. Take *Rosemary* ℔iiß. and proceed as with Sp. Lavandulæ.

Action. Uses. Stimulant Spirit. Often employed to impart an agreeable odour to Lotions. An ingredient of Linimentum Saponis, L. P.

Tribe *Satureineœ.* Cor. 2-lipped. Stamens 4, distant. Anther-cells separate, divergent.

ORIGANUM VULGARE, E. Herb. Common Marjoram.

The *ὀρίγανος* of the Greeks and *satar* of the Arabs is supposed to be this plant.

Root creeping. Stem erect, 1—2 feet high. Leaves stalked, broad, ovate, obtuse, often slightly serrate. Spikes oblong, 4-sided, imbricated, with bracts, clustered in corymbose panicles. Bracts ovate, obtuse, coloured, longer than the calyx, which has 5 equal teeth, and is 10—13-nerved, throat hairy. Corol upper lip straight, nearly flat; lower spreading, 3-fid. Stamens divergent, connective subtriangular. Achænia rather smooth.—Europe, the Mediterranean region, and extending to the Himalayas.—E. B. 1143. St. and Ch. 131.

ORIGANUM MAJORANA, *Linn.*, D., now MAJORANA HORTENSIS, *Mœnch.*, is the *Sweet Marjoram* of the gardens. Native of the south of Europe and Syria.

Wild Marjoram has a strong rather agreeable odour, and a bitter aromatic taste, which it retains in its dry state. Its properties depend chiefly on its Volatile Oil.

Action. Uses. Stimulant, Carminative. May be used in Infusion.

OLEUM ORIGANI, E. Oil of Marjoram: called *Oil of Thyme.**

Distil the herb with water. A reddish oil is obtained, which becomes colourless on redistillation. The E. C. mentions the oil of *Origanum Majorana.*

Action. Uses. Stimulant, in doses of ♏v. ♏x. Chiefly used externally, with Olive Oil, &c., as a remedy for toothache.

* Mr. D. Hanbury has shown that the *Ol. Origani* of English druggists is not only called so, but is in fact *Oil of Thyme,* being distilled in large quantities from the *Thymus vulgaris* in the Department of the Gard in the south of France.

Tribe *Melissineæ.* Corol 2-lipped. Stamens distant. Anther cells connected above.

MELISSA OFFICINALIS, *Linn.* E. The Herb. Common Balm.

This plant is supposed to be the Μελισσόφυλλον of Dioscorides.

Stem branched, 1—2 feet high. Leaves ovate, acute, cordate at base, crenate. Flowers white, in axillary unilateral racemes. Calyx 13-nerved, subcampanulate, slightly ventricose in front, 2-lipped, upper lip flat, truncate, with 3 short broad teeth, lower with 2 lanceolate teeth. Corol, upper lip concave, lower spreading, trifid, with apices of stamens connivent under the upper lip of the corol. Anther-cells divergent.—South of Europe; cultivated in English gardens. —Esenb. and Eberm. 180.

Balm has an agreeable odour, like that of the Citron, and a mild aromatic taste, with a little astringency, its properties depending, as in the other Labiatæ, on Volatile Oil, Bitter principle, and Tannin.

Action. Uses. Mild Stimulant. Much used on the Continent in the slighter Nervous affections, generally in the form of Infusion (ℨiv. —Aq. Oj.) or *Balm Tea.*

Tribe *Stachydeæ.* Stamens approximating, parallel under the upper lip of the corol, 2 inferior largest. Calyx tubular or bell-shaped, spreading in front.

The common White Horehound, *Marrubium Vulgare*, is much used in popular medicine as an aromatic tonic, in coughs, &c., but is not now officinal.

SCHROPHULARINEÆ, *Brown.* Figworts.

They are allied on one side to Labiatæ, on the other to Solanaceæ. They are found in all parts of the world. Some are acrid, but the majority have few active properties. To this Digitalis is an exception. The indigenous *Schrophularia nodosa*, which is slightly acrid, is sometimes made use of in the form of ointment as an application to indolent tumours and sores.

DIGITALIS, L. E. D. Digitalis purpurea, *Linn.* Herbæ agrestis Folium caulinum, recens et exsiccatum, L. The leaves, E. D.

Foxglove does not appear to have been known to the ancients. Fuchsius was the first to describe it, and to name it Digitalis, from the resemblance of its flowers to the finger of a glove. It was admitted into the L. P. of 1668 and 1721, rejected in that of 1745. Withering brought it into permanent notice in 1775.

Biennial. Root fibrous. In the first year a tuft of radical leaves is thrown up, from the midst of which rises, in the second year, a Stem 1—5 feet high, which is erect, wand-like, and leafy, slightly angled and downy, in some varieties with a purple tinge, as well as on the lower surface of the leaves. Leaves alternate, ovate-lanceolate, or oblong, crenate, and rugose, downy, especially on the under surface, tapering at the base into winged footstalks. Racemes terminal, long, and lax, on which the pendulous flowers appear on one side in slow succession. Flowers crimson, purple, marked with eye-like

spots, and hairy within; sometimes white. Calyx 5-parted, segments ovate, or oblong-acute. Corol declinate, much longer than the calyx, contracted at the base, campanulate and ventricose above, with an oblique limb; upper limb emarginate, lower 3-fid, with the middle lobe the largest, all short, obtuse. Stamens 4, didynamous, ascending; anthers smooth. Stigma bilamellate. Capsule ovate-acute, with a septicidal dehiscence. Seeds very small, of a pale brownish colour, and pitted.—Indigenous, and also common chiefly in the western parts of the Continent: found on pastures and exposed hill sides, as also in plantations; begins to flower in June and July, and ripens its seed in August and September.—Nees von E. 154. St. and Ch. i. 18.

The leaves only are officinal. The roots, collected in the autumn or winter of their first year, are possessed of active properties; so also are the seeds. The leaves of this plant, like the leaves of all biennial plants, Dr. Houlton says, should be gathered in the second year of their duration, and as soon as possible after the first flowers have expanded: he also prefers those plants which have a purplish stem. Dr. Christison, however, thinks this a needless restriction. He has observed that their bitterness, which probably measures their activity, is very intense both in February and September, and that their extract is highly energetic as a poison in the middle of April, before any appearance of the flowering stem. The proportion of solid matter in the leaves is larger in summer than in spring. Von Hees found the amount of dry leaf yielded by the fresh leaf in May to be 15·8 per cent; in July, 17·4 per cent. Full-grown and perfect leaves should be chosen, especially of such plants as grow spontaneously in open situations. They are to be gathered before the terminal flowers have expanded. (L. P.) They should be carefully dried in a dark airy room, the midrib and petiole being first separated, and kept so that the light be excluded. They should be renewed annually, have a dull, but when powdered, a fine green colour, a slight odour, with the strong bitterness of the recent plant. The juice of the fresh plant may be expressed and evaporated to the consistence of an extract, or its active properties imparted to water or Spirit. The leaves of Digitalis have been found to contain traces of Volatile Oil, Fixed Fatty matter, a red Colouring matter, Chlorophylle, Albumen, Starch, Sugar, Gum, salts of Potash, Lime, and of Magnesia, an acid, partly free and partly combined, and a peculiar Bitter principle (*Digitaline*), on which the activity of the plant depends. (*Homolle.*) This Bitter matter is soluble in Alcohol, a little so in Ether, and dissolves in water with the aid of the substances with which it is combined and mixed. It has been known that Sesquichloride of Iron produces a greenish-black and Tincture of Gall-nuts a greyish precipitate, and it was by means of Tannin and Oxide of Lead that M. Homolle and subsequently M. Henry succeeded in isolating Digitaline, which (according to their account) is excessively bitter, a little irritant, scarcely soluble in water, very soluble in Spirit; melts with heat, and may be drawn into long threads of a pearly appearance; cooled, it is easily reduced to a yellowish-white powder, which must be kept from

air and light. From its solution in Spirit it may be separated in beautiful white scales.* Dr. Morries Sterling, by the destructive distillation of the dried leaves, obtained an empyreumatic oil, containing a crystalline principle possessed of narcotic properties.

The leaves of Foxglove are apt to be intermixed with those of *Verbascum Thapsus*, also with those of *Symphytum officinale*, and sometimes with those of *Conyza squarrosa*, but they may be distinguished by attending to the description, or by comparison with genuine leaves.

"The leaf of Foxglove is sub-sessile or shortly-stalked, ovate or oblong lanceolate, narrowed at the base, crenate, rugous and veined, downy underneath or on both sides." L. P.

Action. Uses. Indirectly Sedative, that is, first exciting and then greatly diminishing the force and frequency of the heart's action. The intestinal canal is apt to be disordered by large doses, as well as the brain and organs of the senses affected by vertigo, &c. The kidneys are often acted on, and the secretion of urine increased. It is cumulative in its effects; therefore when nausea or intermission of the pulse occurs, its use should be discontinued for a time, and the patient should not rise from the recumbent position when under its influence. It has been used to control the circulation, in diseases of the Heart, in Fever, in Inflammations, and in Pulmonary affections after the acute symptoms have subsided, and is useful in excitement from nervous irritability. It is much prescribed as a Diuretic in Dropsies of all kinds, but is most useful in those associated with a debilitated and generally diseased state of the constitution.

D. Of the powder to act as a Sedative, gr. j.—gr. jß. should be given 5 or 6 times a day, carefully watching its effects. As a Diuretic, gr. j.—gr. iij. 3 times a day, usually with some aromatic; but those containing Tannin may precipitate its active principle.

Antidotes. In cases of poisoning, or of excessive doses, evacuate the stomach, and assist the vomiting with diluents; prescribe astringents containing Tannin, as Infusion of Nutgalls, of Oak-bark, of Green Tea; preserve the recumbent position; administer Ammonia, Wine, Brandy, Aromatics.

INFUSUM DIGITALIS, L. E. D. Infusion of Foxglove.

Prep. L. In a covered vessel infuse for 4 hours *dried leaves of Digitalis* ʒj. in boiling *Aq. dest.* Oj. Strain. Then add *Spirit of Cinnamon* f℥j.
E. D. Twice as strong.

Action. Uses. An effective preparation in doses of f ʒiv.—f ℥i. (L.) every 3 or 6 hours.

* M. Lebourdais has prepared this alkaloid by shaking up the infusion with a considerable quantity of Animal Charcoal. The latter removes the whole from the fluid. It is separated, washed, and boiled in alcohol. When this is evaporated to a certain bulk, a pulverulent matter subsides; which, being washed, redissolved in alcohol, and this allowed to evaporate spontaneously, forms crystals of Digitaline.

TINCTURA DIGITALIS, L. E. D. Tincture of Foxglove.

Prep. L. Macerate for 7 days *dried leaves of Digitalis* ℥iv. in *Proof Spirit* Oij. Strain.
D. ℥v. to Oij.
E. Same quantity as L. Much better prepared by percolation, as Tinct. Capsicum. If f℥xv. of Spirit be passed through, the density is 944, and f℥j. contains gr. xxiv. of solid contents.

Action. Uses. Sedative, Diuretic, in doses of ♏x.—♏xl. gradually increased. Much larger doses have been given without detriment; but a great deal depends upon the nature of the preparation.

EXTRACTUM DIGITALIS, E. Extract of Foxglove.

Prep. From fresh leaves of *Digitalis*, by any of the processes given for Extr. Conium, E.

Action. Uses. Effective, if carefully prepared, in doses of gr. ß.—gr. j.

PILULÆ DIGITALIS ET SCILLÆ, E. Foxglove and Squill Pills.

Prep. Beat into a proper mass, with *Conserve of Red Roses, Digitalis* and *Squill* āā 1 part, *Aromatic Electuary* 2 parts. Divide into 4-gr. pills.

Action. Uses. Diuretic in doses of gr. iv.—gr. viij., the certainty of action being increased by combination with the Squill.

LINIMENTUM DIGITALIS. The Diuretic effects of Digitalis may be often secured by rubbing the Tincture with Soap Liniment on the abdomen. Or make a Liniment with *Inf. Digitalis* f℥ij. *Liq. Ammoniæ* f℈ij. *Ol. Papaverum* ℈iv. to be used 2 or 3 times a day, diluting it if necessary.

The leaves of the Mullein, *Verbascum Thapsus*, have been popularly employed as demulcent; and those of *Scrophularia Nodosa* as rubefacient; but neither are officinal. Both belong to this order. (Some include *Verbascum* among Solaneæ.)

SOLANEÆ. *Jussieu.* Nightshades. *Pentand. Monog.* Linn.

The Solaneæ are allied to Convolvulaceæ, &c. They are with difficulty distinguished from some of the Scrophularineæ. (Verbascum.) The Solaneæ chiefly inhabit tropical regions, where many are shrubby and even arboreous; a few extend into the temperate and even cold climates of higher latitudes. Several of the species are remarkable for their narcotic properties.

DULCAMARA, L. E. D. Solanum Dulcamara, *Linn.* Ramus novellus, L. The Twigs, E. D. Bitter Sweet. Woody Nightshade.

Dulcamara is supposed to have been employed by the ancients, but has been distinctly known only since the time of Tragus.

Root woody. Stem shrubby, flexible, twining in hedges and over shrubs to the height of 12 or 15 feet. Leaves cordate-ovate, the upper ones more or less auriculate, halberd-shaped, all generally smooth, acute, and entire at the margin. Racemes spreading, cyme-like, opposite to the leaves, or terminal. Flowers

drooping. Bracts minute. Calyx permanent, 5-parted. Corol rotate, 5-parted, purple—coloured with 2 green spots at the base of each segment. Anthers 5, yellow, erect, connivent, opening by 2 pores at the apex. Berry scarlet, ovoid, juicy, many-seeded.—Indigenous in woods and hedges throughout Europe; found also in Asia and America.—Nees von E. 188. St. and Ch. 17.

Solanum nigrum, a small leafy plant, with obtusely angled acute leaves, white rotate flowers, and berries about the size of peas, is said to have the same properties as the above; but it is also narcotic. Its leaves are sometimes sold for those of Belladonna. The twigs of the Potato (*Solanum tuberosum*), of which the tubers are so important on account of their starch, are also said to possess some of the same properties.

The officinal part is the stem and twigs, which should be collected in autumn, when bare of leaves, as directed by the L. C. They are about the thickness of a pen, usually cut into short pieces, sometimes split down the middle; and when dry, they are light, wrinkled, containing much pith, and of a greyish colour. In this state they are scentless, but have a bitter taste, followed by a slight degree of sweetness. It is probable that the root, leaves, and berries have the same properties, which are taken up both by water and Spirit. Analysed, the twigs have been found to contain an alkali, *Solanine* or *Solania*, Gum, Gluten, with Potash and Lime salts. Pfaff indicated the presence of a bitter principle with a sweet after-taste, which he named *Dulcamarine*. (Pelletier considers this to be merely sugar combined with Solania.) *Solania*, when purified, is white, pearly, imperfectly crystalline. It restores the colour of Litmus reddened by an acid. Iodine and Iodide of Potassium produce a permanently dark and turbid brown colour with the solutions of Solania and its salts. It has a faint bitter taste; its salts scarcely crystallize; it does not dilate the pupil, but is said to be a powerful narcotic.

Action. Uses. Alterative in Cutaneous diseases. &c., having a slight determination to the skin and kidneys, also slightly narcotic.

DECOCTUM DULCAMARÆ, L. E. D. Decoction of Dulcamara.

Prep. L. Take *Dulcamara* ℥x., *Aq. dest.* Ojß. Boil down to Oj. Strain. E. D. Similar.

Action. Uses. Alterative, &c. in doses of f℥iß. 2 or 3 times a day, with some aromatic water.

BELLADONNA, L. E. D. Atropa Belladonna, *Linn.* Folium, recens et exsiccatum, L. Leaves, E. Leaves and Root, D. Deadly Nightshade.

This plant has been supposed to be the Mandragora of Theophrastus, and the *strykhnos manicos* of Dioscorides; but it has been distinctly known only since the time of Tragus, and is said to have been first used in Germany as a cure for cancer.

This plant (fig. 82) has a lurid hue, and, when bruised, a fœtid odour. Root perennial, branched, but fleshy, white internally. Stems annual, herbaceous, 3—5 feet high, branched, round, slightly downy or velvety, with a tinge of red.

Leaves with short footstalks, lateral, often in pairs of unequal size, broadly ovate-acute, entire, smooth and soft, 4 or 5 inches in length, often with hairs on under-surface. Flowers solitary, imperfectly axillary, stalked, about an inch in length, rather drooping. Calyx campanulate, 5-cleft. Corol (1) campanulate, an inch long, or twice the length of the calyx, greenish towards the base, but of a dark purple towards its 5-lobed equal border. Stamens 5, distant above.

Fig. 82.

Style (2) as long as the corol. Stigma (3) capitate. Berry (4) seated in the enlarged calyx, globose, 2-celled, of a shining violet-black colour, about the size of a small cherry, with a longitudinal furrow on each side, 2-celled, containing numerous reniform seeds in a mawkishly sweet but neither agreeable nor nauseous pulp.—Indigenous in waste, often shady places, in many parts of Europe.

Flowers in June and July, and its berries are ripe in September.—E. B. 552. Nees von E. 191. St. and Ch. 1.

The root of Belladonna (D. P.) which is branched, thick, fleshy, and often a foot or more in length, is white internally when fresh, and becomes of a greyish colour when dried. The taste is slight, but bitter; the odour feeble, but its properties are energetic. It should be collected in autumn or spring, and the leaves about the time of flowering. These, when stripped from their stems and carefully dried, have a dull-green colour, very little odour, with a slight bitter taste. Those of the wild plant are more esteemed than the leaves of cultivated Belladonna. (L.) The leaves of *Solanum nigrum*, as well as of *S. Dulcamara* (*v.* p. 568), are sometimes actually sold by herbalists for those of Belladonna, and consequently may be sometimes employed medicinally by those who look for the powerful effects of this medicine, and who, being disappointed, will afterwards pronounce upon the inefficiency of the drug. "The leaf of Belladonna is oval, acute, quite entire, glabrous, and stinks when bruised." L. P.

The leaves of Belladonna, analysed by Brandes, yielded Gum, Starch, Albumen, Chlorophylle, a little Wax, several Salts, Lignine, and water, with two nitrogenous substances (Pseudo-toxine and Phytocolla), and an acid Malate of *Atropia.*

Action. Uses. Anodyne, Antispasmodic; externally Anodyne, and used by surgeons for dilating the pupil. The roots possess the same properties as the leaves, and the berries have frequently proved poisonous to children. Dryness and stricture in the throat, difficulty of swallowing, nausea, &c., dimness of vision, dilatation of the pupil, vertigo, mirthful or extravagant delirium, followed by coma, are experienced. It sometimes induces sleep by relieving pain. Anodyne in Neuralgic and other pains; more applicable to those which are external than to internal pains. Antispasmodic in Hooping and other coughs. Thought by some to be Prophylactic against Scarlatina.

D. Of the powder gr. j. gradually increased to gr. v. or until dryness of the throat is experienced. Atropia $\frac{1}{10}$ of a grain produces all the same symptoms, and is preferred for dilating the pupil.

EXTRACTUM BELLADONNÆ, L. E. D. Extract of Belladonna.

Prep. L. To be prepared like Extr. Aconiti.

E. Bruise into a uniform pulp in a marble mortar fresh *Belladonna* q. s. Express, moisten with water, and again express. Unite the expressed fluids, filter, and evaporate the filtered liquids in the vapour-bath to the consistence of firm extract, stirring constantly towards the close.

D. Similar to E.: but the juice is first separated from a sediment which it deposits on standing, and the albuminous coagulum which is produced by the first application of heat is skimmed off. (*v. Ext. Conii.*)

Action. Uses. The Extract of Belladonna is an uncertain preparation, because it is not always prepared with care. The D. P. directions are suited to insure a good preparation, and the Extract pre-

pared in vacuo is an energetic one. Dr. Christison suggests the preparation of an Alcoholic Extract, like that of Aconite of the E. P. (*v.* p. 287).

D. gr. ß. or gr. j. 2 or 3 times a day, gradually increased to gr. v. until the peculiar effects of Belladonna are observed. It is often diluted with water and applied on the eyebrow, to dilate the pupil, or a solution dropped into the eye; or it may be applied externally as a liniment, or used endermically to relieve severe pains. It has also been applied to the os uteri in protracted first labours, and in stricture of the urethra, and spasm of the sphincter ani, &c.

Tinctura Belladonnæ, L. D. Tincture of Belladonna.

Prep. L. Macerate for 7 days *dried Belladonna leaf* ℥iv. in *Proof Spirit* Oij. Press and strain.—D. *Belladonna leaf* ℥v., to *Aq.* Oij.

Action. Uses. Anodyne. *D.* ♏v.—x.

Emplastrum Belladonnæ, L. E. D. Belladonna Plaster.

Prep. L. Melt in a water-bath *Soap Plaster* ℥iij., to this add *Extract of Belladonna* ℥iij. Mix, constantly stirring.
E. D. Half as strong.

Unguentum Belladonnæ, L. Belladonna Ointment.

Prep. Rub up *Ext. Belladon.* ʒj. with *Lard* ℥j.

Action. Uses. Both used as Anodyne in Neuralgic and other pains. Belladonna may also be applied externally in the form of its Infusion, as a Lotion.

Antidotes. Emetics and Purgatives, Astringent Infusions, application of cold to the head, and the use of the ordinary external stimuli; Ammonia internally in the Comatose state, as in Digitalis, p. 567.

Atropia, L. A crystalline alkaloid prepared from the root of Atropa Belladonna. *Atropine.*

This is the active alkali to which Belladonna owes its peculiar powers. It was discovered by Brandes in 1819. It is now for the first time introduced in the L. P.

Prep. No form is given by the L. C. There are several ways of preparing it.

Bouchardat precipitates a watery infusion by means of Iodine. The "Ioduretted Iodide of Atropine" is then decomposed by Zinc and water. The Zinc being completely separated by adding Carb. Potash, the alkaloid is dissolved in alcohol.

Atropia may also be obtained by the charcoal-process applied by Lebourdais to the preparation of Digitaline (p. 567).

The improved process of Mein is as follows. Fresh dried and powdered Belladonna root is exhausted by alcohol, sp. gr. ·822. Slaked Lime is then added to the tincture; 1 part for 24 of the root. Then digest, frequently shaking, for 24 hours. To the filtered liquor add Sulph. acid by drops till in slight excess; then filter again, and distil off more than half of the spirit. To the residue add some water, and evaporate the remainder of the spirit rapidly, but

by a very gentle heat; filter again, and continue to evaporate until the liquid is reduced to 1-12th of the weight of the root employed. Add when cold a strong solution of Carb. Potash by drops, so as to throw down a dark grey precipitate, but not to be in excess. In a few hours filter again; add Carb. Pot. as long as a precipitate (Atropia) is produced; and after 12 hours collect the crystals on a filter, press between folds of blotting paper, and dry them. These are further purified by moistening with water, and again pressing in blotting paper; or by crystallization out of alcohol, and the use of Anim. Charcoal.

(The natural salt of Atropia is extracted by the alcohol, and decomposed by the Lime. As the alkaloid, when free, is readily decomposed by heat, or even by mere contact with water for any time, it is immediately combined with Sulph. acid. The first addition of Carb. Potash, *not* in excess, precipitates a resin. The second addition of the Carbonate neutralizes the acid present, and precipitates Atropia.) By this process Mein obtained 20 gr. from 12 oz. of the root.

The formula of Atropia, according to Planta, is the same as that of Daturia—$C_{34}\ H_{23}\ N\ O_6$. It crystallizes in white, silky, transparent prisms, or in needles, like Disulph. Quina. It has no odour, but a bitter and acrid taste. It is soluble in 200 parts of cold, 54 of hot water, and in $1\frac{1}{2}$ of cold Alcohol; but requires 25 parts of ether to dissolve it. It reacts as an alkali. By heat it is first fused, then partly volatilized, partly decomposed. It combines with acids to form bitter soluble salts. With Nit. acid it forms a yellow solution; heated with Sulph. acid it becomes red (Pereira). Heated with Potash or Soda it is decomposed, evolving Ammonia. It is reddened by Iodine, and precipitated by Tannic acid. It produces a crystalline precipitate with Perchloride of Gold, and a pulverulent one with the Bichlorides of Platinum and Mercury. (Planta.)

Action. Uses. Atropia possesses the properties of Belladonna in a high degree, being a powerful poison. It is dangerous for internal use, though it has been given in doses of gr. $\frac{1}{30}$—$\frac{1}{10}$. But it is of use to surgeons, as preferable to Belladonna for producing dilatation of the pupil of the eye in cases of cataract, glaucoma, &c. 1—2 gr. may be dissolved in 1 oz. of water, and a few drops of this solution applied to the eye.

ATROPIÆ SULPHAS, L. Sulphate of Atropia.

Prep. To *Aq. dest.* f℥ß., mixed with *Acid Sulph. dil.* f℥ij., add *Atropia* ℈viiß., or q. s., by degrees, to saturation. Strain the liquor, and evaporate with a gentle heat, that crystals may form.

Only intended for external use. L. P.

This soluble salt is preferred by many to the simple alkaloid for the same purposes for which the latter is employed. It has the advantage of being more soluble in water, and less liable to decomposition. To cause dilatation of the pupil, a solution may be made of 1 gr. of Sulph. Atropiæ and f ℨj. of Dist. water.

CAPSICUM, L. E. D. (*Guineense*, L.) Capsicum fastigiatum, *Blume*, L. C. annuum, E. D. Fructus; the Fruit. Capsicum. Chillies.

The several species of Capsicum are natives of South America, whence they have been introduced into the Old World, and become

universally diffused, from the fondness of Asiatics for warm condiments. The Hindoos, though cultivating the Capsicum extensively, have no specific name for it, but call it *Red Pepper.* "Chilli, either simply or in composition, being the Mexican name for all the varieties and species of this genus" (*R. Brown*), indicates that the genus is American. Many varieties have no doubt been raised to the rank of species. The genus is distinguished by its berry-like but dry fruit.

The officinal Capsicum (C. annuum, *Linn.* fastigiatum, *Blume*) is annual, smooth, dark-green in colour, from 1—2 feet high, with branched, furrowed, angular stems. Leaves ovate, acuminate, sometimes lanceolate, entire, shining, sometimes hairy beneath on the veins. Flowers small, white, axillary, solitary, drooping. Calyx 5-cleft. Corol rotate, equal. Stamens 5; filaments short; anthers dark-coloured, connivent, opening longitudinally. Fruit firm, succulent, 2-celled, containing numerous dry flat seeds. The fruit varies much in form, being round, oblong, cordate, or horned, and either scarlet or yellow, and more or less pungent in taste. The horn-shaped variety is most common, from 2—3 inches in length, and from ½—1 inch diameter at the base. These are usually called Capsicums, and the plant *C. annuum.* One variety, called Cockspur-pepper, has the fruit long and slender. Sometimes the fruit is globose or lobed: the variety is then called *C. baccatum.* When the fruit is small, elongated, and pointed, the variety is called Bird-Pepper, and botanically *C. minimum.* When the plants are allowed to grow beyond the year, they become shrubby, and form the species or variety called *C. frutescens.*—Cultivated in all hot countries, but also under glass in this country.—Nees von E. 190. St. and Ch. 44.

The Berry or fruit of the Capsicum, in its dried state, is the only officinal part. Some berries are 2 or 3 inches long, but others, which are much smaller, are preferred. "The Capsicum fruit is less than an inch in length, oblong-cylindrical, and straight." (L. P.) These fruits, when powdered, form Cayenne Pepper, but are often preserved in vinegar as a pickle, and the fluid employed under the name of Chilly Vinegar. The active properties are taken up also by water, Spirit, Ether, and fixed oils. Analysed by Forchhammer, a red Colouring matter, a nitrogenous substance, Mucilage, and some salts, were found; and at the same time a neutral, resinous, active principle, *Capsicine*, white, brilliant, pearly, and very acrid. But Braconnot describes the acrid principle as of an oleaginous nature, very acrid in taste, readily volatilizing, and diffusing a very acrid vapour.

Action. Uses. Rubefacient, Acrid Stimulant. Much used as a Condiment in hot countries. Sometimes used as a Counter-Irritant, with salt as a Stimulant in Scarlatina maligna, as a Gargle in relaxed sore throat, or in the form of Cayenne Lozenges.

TINCTURA CAPSICI, L. E. D. Tincture of Capsicum.

Prep. L. Macerate for 7 days *bruised Capsicum* ℥x. in *Proof Spirit* Oij. Strain.

E. Similar: or is better prepared by percolation, to be commenced as soon as the Capsicum in fine powder is made into a pulp with a little of the Spirit.

D. More than twice as strong.

Action. Uses. Irritant. Stimulant in doses of ♏v.—fʒß. or as a Gargle (fʒiv.—Inf. Rosæ f℥viij.) Dr. Turnbull uses a concentrated Tincture (℥iv. to Rect. Sp. f℥xij.) as a Counter-Irritant.

Stramonium, L. E. D. Folium et Semen, L. The Herb, E. The Seeds, D. Datura Stramonium, *Linn.* Thornapple.

Species of Datura (Sans. *Dhatoora*) have long been employed medicinally by the Hindoos, and were thus made known to the Arabs, who curiously give Stramonia as a synonyme of Datura. It is their *jouzmasil*, that is, *masil* or *methel*, which has long been referred to Datura. *D. Stramonium* occurs in the Himalayas (*v.* Himal. Bot. p. 279), and is probably indigenous in the Hindoo Khoosh, whence most likely it was taken to Constantinople, having been obtained by Gerard from that city, and by Fuchsius from Italy.

The Thornapple (fig. 83) is an annual of vigorous growth, about 3—5 feet high. Stem much branched, dichotomous above, bushy, fœtid, smooth. Root large, white, and fibrous. Leaves from the forks of the stem, large, unequal at the base, ovate, unequally sinuate-dentate, smooth, variously and acutely sinuated and toothed, simply veined, of a light dull-green colour. Flowers axillary, erect, white, sweet-scented ,especially at night, about 3 inches long. Calyx oblong,

Fig. 83.

tubular, ventricose, 5-angled, 5-toothed, dropping off and leaving a circular mark round the base of the ovary. Corolla funnel-shaped, regular, angular, plaited with mucronate lobes. Stamens 5. Stigma thick, obtuse, 2-lobed. Ovary 4-celled. Capsule as large as a walnut, dry, very prickly, 4-valved, with 2 partially bipartite cells, containing many brownish or black flattened reniform seeds.—Waste places and dung-heaps in all parts of Europe, also in North America. No doubt introduced from Asia. Flowers in July.—Nees von E. 193. St. and Ch. 6.

The whole plant has a rank odour, which may be detected at a distance. All parts possess medicinal properties; the leaves and seeds being officinal in the L. and D. P., the whole plant in the E. P. The *seeds* are brownish or black, flattened, kidney-shaped, without odour, except when bruised, but with a bitter weakish taste; often employed for poisoning in India, where pulses form so large an article of diet. The *leaves* should be gathered when the flower-buds begin to blow. They have a fœtid odour, especially when bruised; this they lose in drying. Their taste is rather bitter and nauseous.

Analysed by Brandes, the seeds yielded Fixed Oil, Wax, Resin, Extractive, Gum, Albumen, &c., with salts, and a Malate of *Daturia.* This alkali has been obtained by Geiger and Hesse, who describe it as occurring in brilliant crystals, without odour, and colourless, having a bitterish, tobacco-like taste, alkaline, easily soluble in Alcohol, less so in ether, forming salts with acids. It requires for solution 280 parts of cold, 72 of boiling water. It resembles Hyoscyamia. Planta calculates the equiv. to be $C_{34} H_{23} N O_6$. The fresh leaves of Stramonium did not yield Promnitz anything except the ordinary vegetable constituents, though they must also contain the Daturia. Mr. Morries Stirling, by the destructive distillation of Stramonium, obtained an empyreumatic oil, which contained an active poisonous principle.

Action. Uses. Anodyne. Antispasmodic, and as such may be combined with Valerian. By relieving pain, it will induce sleep; and affects the constitution much in the same way as Belladonna, in doses of the powder, gr. j.—gr. v. In Neuralgic and in Rheumatic pains it has given relief both when taken internally and applied externally. It has also been considered calmative in Mania. In Spasmodic Asthma smoking the leaf (gr. x.—3ß.) often gives instantaneous relief; but it must be exhibited with care. M. Trousseau recommends its being smoked with an equal quantity of Sage leaves, in a roll of paper. In India I used to order it to be added to the ordinary chillum of Tobacco; or prescribe inhalation from warm water in which Datura leaves had been infused. Mr. Skipton found f℥ij. of an infusion of the root (℥j. to aq. Ojß.) of *Datura fastuosa* give great relief. But the most convenient practice is that of smoking the Stramonium cigars, which are prepared by some chemists. Daturia is an energetic poison, and very small quantities cause dilatation of the pupil.

Extractum Stramonii, L. E. Extract of Stramonium Seeds.

Prep. L. Macerate for 4 hours in a lightly covered vessel near the fire in boiling *Aq. dest.* Cj., *Seeds of Stramonium* ℥xv. Take the seeds out, and bruise them in a stone mortar, return them to the liquor, and boil down to Oiv. While hot filter, and evaporate to the proper consistence.

E. Grind in a coffee-mill *Seeds of Stramonium* q. s. Rub the powder into a thick mass with *Proof Spirit,* which transmit through the pulp in a percolator, till it passes colourless. Distil off the Spirit, and in the vapour-bath evaporate the residuum to a proper consistence. This alcoholic extract is the best form.

Action. Uses. Anodyne. Antispasmodic in doses of gr. $\frac{1}{4}$—gr. iij. or it may be made moist and applied over a pained part.

TINCTURA STRAMONII, D. Tincture of Stramonium.

Prep. Macerate bruised *Stramonium Seeds* ℥v. in *Proof Spirit* Oij. for 14 days; strain, express, and filter.

D. f℥ß. two or three times a day.

Antidotes. Stimulant emetics, cold effusion, with blisters to nape of neck, in cases of poisoning with Belladonna.

HYOSCYAMUS, L. E. D. Hyoscyamus Niger, Linn. Herbæ biennis Folium caulinum, recens et exsiccatum, L. The leaves, E. D. Henbane.

Henbane has been employed in medicine from the earliest times; is the *ὑοσκύαμος* of the Greeks, and the *bunj* of the Arabs. The seeds are known by the name of *Khorassani Ujwain* in India.

Henbane (fig. 84) is annual or biennial, that is, plants grown from the seed of the biennial variety will, in favourable conditions of the soil and climate, come to full perfection in the first year. Roots spindle-shaped, those of biennial plants having considerable resemblance to small parsnep-roots in the winter, and spring. (*Houlton.*) The plants in the first year throw up a tuft of radical leaves which are petiolated, woolly, and possess little of that clamminess and odour which are peculiar to the mature plant. In the second spring, another set of leaves make their appearance with, and attached to the flowering stem. This is from a foot to 3 feet high, seldom branched, hairy; hairs glandular, and viscid. Leaves sessile, subamplexicaul, occasionally decurrent, lower ones sometimes stalked, oblong-acute, coarsely and unequally cut or sinuate, appearing pinnatifid, clammy, and fœtid, of a pale dull green colour, slightly pubescent with long glandular hairs, like those of the stem, upon the midrib. Flowers nearly sessile, axillary, subsolitary, unilateral, erect, much shorter than the leaves. Calyx funnel-shaped, 5-lobed, villous. Corol (2) funnel-shaped, limb spreading, 5-lobed, not

Fig. 84.

quite equal, of a dull straw-colour, marked with dark purple veins. Stamens 5, declinate; filaments pubescent. Ovary ovoid, shining, 2-celled, with numerous ovules attached to the placentæ. Style filiform. Stigma (1) capitate. Capsule opening transversely by a convex lid, 2-celled, many-seeded. Seeds small, roundish, finely dotted, of a light grey colour.—Indigenous in waste grounds throughout Europe, also in the Persian region of Botanists.—Nees von E. 192. St. and Ch. 9. Two varieties, biennial and annual, are cultivated at Mitcham. The latter is smaller, and its corolla often without the purple veins.

Henbane plants generally come into flower about the beginning of June, but the annual plants a little later: the seeds ripen from August to October. Mr. Houlton is of opinion that the biennial plant should alone be employed medicinally, (as ordered by the L. C.), and that the leaves should be collected when the first flowers begin to appear. But it has not been proved that annual plants, when properly grown, are devoid of active properties. The author was in the habit of largely cultivating Henbane in the Botanic garden at Saharunpore, where, from the nature of the climate, the whole process of cultivation, including the ripening of the seed, was completed between the months of October and March. The Extract made from these plants was highly approved of by several medical officers, and pronounced by Mr. Twining, after trial in the General Hospital at Calcutta, to be of "most excellent quality" (Himal. Bot. p. 281). But the secretions of plants growing in a colder and moister climate, or in seasons having these characteristics, may not come to as great perfection in the first year. Dr. Christison states, from experiments made in the Royal Infirmary at Edinburgh, "that inferiority of cultivated plants, if it exists at all, seems not appreciable in practice;" and, with respect to the period at which the leaves acquire their activity, he says, "I have found them sufficiently active even in the spring, before the appearance of the flowering stem." But according to the directions of the L. C., the leaves must be collected at the time of flowering. They then spring from the stem. The old last year's leaves, which are known by their long stalks springing from the ground, are not to be used. When collected, they should as soon as possible be separated from the stem, spread out, and dried in a warm airy room. They ought to have a mucilaginous, slightly bitter taste, and should retain some of the peculiar odour of the plant. "The leaf of Hyoscyamus is sessile, oblong, acutely sinuous, and subpubescent with viscid and fœtid hairs." L. P.

Lindbergson has found in the leaves of Henbane the usual gummy matters of plants, along with a bitter extractive, a narcotic principle, and various salts of Magnesia. The active narcotic principle was discovered by Brandes to be a *Malate* of a peculiar alkaloid, *Hyoscyamia*, which strongly resembles *Atropia* in its properties, but is more soluble in water.

Geiger and Hesse obtained this alkaloid in groups of radiated needle-like crystals, fusible and volatile, but readily decomposed when distilled, alkaline in nature, neutralizing acids and forming crystal-

lizable salts, soluble in Alcohol and Ether, less so in water. Pure *Hyoscyamia*, which is very poisonous, dilates the pupils, and, when moistened, smells strongly of Tobacco.

A highly poisonous empyreumatic oil is obtained by destructive distillation, as from the other Solaneæ and from Foxglove.

Action. Uses. Narcotic, Anodyne, and Soporific. Available for a variety of cases where we wish to relieve pain, allay irritability, and procure sleep, having the advantage of not constipating the bowels like Opium. Hence it is frequently prescribed with Calomel, Purgatives, or with Antispasmodics. It may be given internally in powder in doses of gr. v.—gr. x., or in Extract or Tincture; or it may be applied externally in the form of fomentation, or in cataplasms of its leaves, or its Extract or Tincture used as those of Belladonna.

EXTRACTUM HYOSCYAMI, L. E. D. Extract of Henbane.

Prep. L. As Extractum Aconiti, L. (p. 287). E. By any of the processes directed for Extract of Conium. D. As Ext. Belladonnæ.

Action. Uses. The expressed juice evaporated spontaneously in a dry current of air, or in vacuo, forms an excellent preparation. A still more powerful preparation may be obtained by the action of Alcohol. The Ext. is adapted for all the purposes of Henbane in doses of gr. v. —℈j. The author has also found the *Succus Hyoscyami* of Mr. Bentley a very good form of preparation.

TINCTURA HYOSCYAMI, L. E. D. Tincture of Henbane.

Prep. L. D. Macerate for 7 days *dried leaves of Hyoscyamus niger* ℥v. in *Proof Spirit* Oij. Strain.

E. Similar: or much better prepared by percolation, as the Tinct. of Capsicum.

Action. Uses. Narcotic, &c. in doses of ♏x. as soothing, or fℨj. to fℨij. as a Hypnotic.

TABACUM, L. E. D. Nicotiana Tabacum, *Linn.* Folium, L. The Leaves, E. D. Tobacco.

Tobacco was introduced from the New World about the middle of the 16th century, and is now extensively cultivated in most parts of the world.

Root fibrous. Stem erect, branched, and viscid, from 2 to 6 feet high. Leaves sessile, oblong, lanceolate, the lower ones decurrent, very large, a little hairy, viscid. Flowers in terminal panicles. Bracts linear-acute. Calyx tubular, swelling, 5-cleft, hairy, glutinous. Corol rose-coloured, funnel-shaped, throat inflated, ventricose, limb spreading, plicate, with 5-cleft acuminate segments. Stamens 5, declinate. Ovary ovate. Style long. Stigma emarginate. Capsule usually 2-celled, 2-valved, opening crosswise at top, valves finally bifid. Seeds numerous, small, kidney-shaped, attached to fleshy placentæ,—Warm parts of America, but now cultivated in most parts of the world.—Nees von E. 194. St. and Ch. 37.

Most of the Tobacco of commerce, as that of Virginia, is yielded by this

species, as is that of India. Small Havannah cigars are said to be formed of the leaves of *N. repanda;* the Syrian and Turkish Tobaccos to be yielded by *N. rustica,* and the fine Shiraz Tobacco by *N. persica,* Lind.

Tobacco, as it occurs in commerce, is of a yellowish brown colour, soft and pliable, a little clammy, with something of a honey smell, mixed with a narcotic odour; the latter, however, is not obvious in the fresh leaves. The taste is bitter, acrid, and nauseous. Virginian Tobacco, though the strongest, is best adapted for medical use, in order to observe uniformity of strength. Its active properties are taken up by water, Spirit, and Wine, but are destroyed by heat. Tobacco was elaborately analysed by Vauquelin. *Nicotianin* (a concrete Volatile Oil), was discovered by Hermbstadt in 1821. The analysis of Posselt and Reimann displayed the presence of *Nicotia* ·06, of *Nicotianin* 0·01, Extractive 2·87, Gum 1·74, Chlorophylle 0·26, Vegetable Albumen and Gluten 1·30, Malic acid 0·51, Lignin and Starch 4·65, Salts 0·73, Silica 0·08, Water 88·28 = 100 nearly. *Nicotia* has since been studied by Boutron and Henry. Orfila obtained it by passing tobacco smoke into water acidulated with Sulph. acid, decomposing the sulphate by Potash, and volatilizing the alkaloid by heat. It is a limpid, oily, volatile liquid, devoid of colour, having an acrid taste, and a weak smell of Tobacco, stronger when heated. Its vapours are extremely acrid, with an overpowering odour of Tobacco. It has a Sp. Gr. of 1·048, is alkaline, forms salts with acids, is soluble in Alcohol, Ether, and water, and in fixed and volatile Oils. It is volatile at 77° F. It reacts with most metallic bases in the same way as Ammonia. It is turned red by strong SO_3; disengages white vapours with cold H Cl, and produces a violet colour when heated with that acid. Heated with Nit. acid it passes through several shades of yellow and red. It differs also from Ammonia in being precipitated by tannic acid, and in giving with Perchlor. Gold a precipitate which is soluble in excess of Nicotia. It is the active principle of Tobacco, and is extremely poisonous. Nicotia exists in combination in Tobacco, and is found varying in proportion from 4 to 12 parts in 1000. It is composed of $C_{20} H_{14} N_2$. *Nicotianin* is a camphoraceous volatile oil, bitterish in taste, having the odour of Tobacco, and seeming to owe its properties to a little Nicotia intermixed with it. By the destructive distillation of Tobacco, an *empyreumatic oil* is formed, which is better known as produced in tobacco-pipes, and as being highly poisonous. This seems also to be a volatile oil holding some Nicotia in solution.

Action. Uses. Local Stimulant, hence used as an Errhine and Sialogogue: secondarily Sedative, Antispasmodic, also Emetic, Laxative, and Diuretic; and acts upon the system, to whatever surface it is supplied. Chiefly employed to produce relaxation in Spasmodic affections, as in strangulated Hernia, obstinate constipation from spasm of the bowels, or retention of urine from that of the urethra.

ENEMA TABACI, L. E. D. Tobacco Enema.

Prep. L. Macerate for ½ hour *Tobacco* ℈j. in *Aq. fervent* Oß. Strain.
E. Gr. xv—xxx. in *Aq.* f℥viij.
D. ℈j. in f℥viij.

Action. Uses. Sedative, Antispasmodic. Used only in the above cases. ℈j. is sufficient for trial at first.

VINUM TABACI, E. Tobacco Wine.

Prep. Digest *Tobacco* ℥iij. in *Sherry* Oij. for 7 days. Strain, express the residue strongly. Filter.

Action. Uses. Sedative and Diuretic. Capable of producing the full effects of Tobacco in doses of ♏x.—♏xl.

Sub-Class IV. APETALÆ.

POLYGONEÆ, *Juss.* Buckwheats.

They are found in the greatest numbers in the temperate regions of the northern hemisphere, but some in almost all parts of the world. The young shoots of many are acid (chiefly containing Oxalic acid); when older, an astringent together with a purgative principle is secreted by species of Rheum and of Rumex. The seeds of many, as the Buck-wheats, or Fagopyrum, afford nutritious flour. *Coccoloba uvifera*, or the Seaside Grape, is said to yield Jamaica Kino.

POLYGONUM BISTORTA. Bistort.

The rootstock of this indigenous plant contains a large proportion of Tannin, some Gallic acid, and Starch, with woody fibre, and has a rough astringent taste. It is dark brown, rugose with annular rings, often twice bent on itself. It is not now officinal.

Action. Uses. Astringent, either internally in doses of gr.xv.–ʒß. or made into a decoction, in doses of f℥iß.; or externally as a lotion; has also been prescribed in Intermittents.

Various indigenous species of *Rumex*, or Dock, have been employed in medicine. The roots generally contain a bitter principle. *R. acetosa*, the common *Sorrel*, secretes in its leaves Binoxalate of Potash. So also do others of the genus, in a less degree.

RHEUM, L. E. D. (*Sinense*, L.) Species incerta; undetermined species of Rheum, L. E. D. Radix, the Root. Rhubarb.

The name Rheum is derived from the *ῥέον* of Dioscorides; but his description does not well apply to modern Rhubarb. This was, however, known to Paulus Ægineta, &c. The Arabs were acquainted with several kinds, as Indian, Khorassanee, Chinese (their *rewund sini*). The Persians give *reon* as the Greek synonyme of their *rawund*, which is Rhubarb, and of which the plant they say is called *ribas*. Rhubarb is no doubt the rootstock of a species of Rheum, but the species is still unknown. The author, after giving in another work (Him. Bot. p. 314—318) an account of the commerce of Rhubarb, stated that

the information collected by him on this subject, " would bring the Rhubarb country within 95° of E. long. and 35° of N. latitude, that is, into the heart of Thibet. As no naturalist has visited this part, and neither seeds nor plants have been obtained thence, it is as yet unknown what species yields the Rhubarb." This is now the general opinion. Sievers, an apothecary sent in 1790 by the Russians to investigate the subject, had previously said, that " his travels had satisfied him that as yet nobody, that is, no scientific person, has yet seen the true Rhubarb plant." Dr. Fischer when in London, subsequent to the above publication, informed the author that all the information obtained of late years in Russia, only confirmed what was previously known, that *Rheum palmatum* is not the species, but that the genuine plant is a small one with roundish denticulate leaves. So more recently, Calau, apothecary in the Rhubarb factory at Kiachta, says: " All that we yet know of the Rhubarb plant or its origin is defective and wrong; every sacrifice to obtain a true plant, or the seed, has been in vain; nor has the author been enabled to obtain it." Dr. Falconer entered Thibet from the side of Cashmere, and proceeded as far as the Muztah range, or about long. 77° E. and lat. 36°, a region where Rhubarb is sent as a present to the Chief Ahmed Shah from the true Rhubarb country, but was unable to learn anything respecting commercial Rhubarb. He discovered new species of Rheum, and obtained specimens of genuine Extract of Rhubarb, *ossareh-rewund*, or Rhubarb-juice, a name which he as well as the author found applied in north-west India to Gamboge. He also found Rhubarb-root employed there as a yellow dye. Some information might probably be procured respecting Rhubarb from the traders to Upper Assam.

RHEUM, *Linn.* *Enneandria Monog.* Linn.

Flowers complete; perianth petaloid, 6-parted, with equal segments. Stamens usually 9, inserted in pairs into the base of the 3 outer segments, and singly into the 3 interior; filaments subulate; anthers versatile. Ovary triangular, 1-celled. Ovule single, basilary, orthotropous. Styles 3, short, reflexed, Stigmas 3, entire, subdiscoid, spreading. Achænium 3-cornered, broadly winged, supported by the withered perianth at the base. Seed erect, triangular. Embryo straight, antitropous, in the axis of farinaceous albumen. Cotyledons flat, radicle short, superior.

Herbaceous plants, with perennial and branching rootstocks, which are thick and succulent. Stem of most 4 to 10 feet high, except in Nos. 1 and 2. Leaves large, more or less cordate, wavy at the margin, sheathing at the base, either all radical, or, where cauline, alternate. Inflorescence paniculate, or spicato-racemose. The species are valuable not only on account of their rootstocks or Rhubarb, but also from the agreeable acidity of their leaf-stalks, employed for making sherbets, tarts, &c. They inhabit cold parts of the world, as the southern part of Russia, Siberia, Thibet, the north of China, and the Himalayan mountains, also Affghanistan and Persia. Hence all may be grown in the open air in Europe, and several are so cultivated. As no species seems more entitled than another to be considered as yielding either the Russian or Chinese Rhubarb of commerce, we shall briefly enumerate all, without describing any.

With Spike-like Racemes.

1. Rheum spiciforme, *Royle.* (Illustr. Himal. Bot. p. 318. t. 78.) Kherang Pass and other places in Kunawar. Found by Dr. Falconer in Thibet.

2. R. Moorcroftianum, *Royle.* (*l. c.* p. 318. Lindl. Med. Bot. p. 356.) Niti Pass in the Himalayas. Found by Dr. Falconer in Thibet.

These two species differ in their inflorescence from the other described species. Their roots are more dense in texture and of a more yellow colour than those of *R. Emodi* and *R. Webbianum.* The powder of both is of a light and bright yellow colour. Dr. Falconer met with both in Thibet, and discovered another species of this group. It is probable that the commercial species will be found to resemble these in habit, from being indigenous, like them, in the elevated, arid, and cold regions of Tartary.

With Compound Racemes.

3. R. emodi, *Wall.* Bot. Mag. t. 3508. *R. Australe,* Don. Sweet, Fl. Gard. t. 269. Nees von E. Suppl. t. 31. A. and B. Lindl. Fl. Med. p. 354.

4. R. Webbianum, *Royle, l. c.* p. 318. t. 78, a. Choor Mountain. Niti Pass. This yielded the Rhubarb submitted to experiment by Mr. Twining. Trans. Med. Soc. Calc. iii. p. 439.

5. R. Ribes, *Linn.* Dill. Elth. t. 158. f. 192. An. Mus. 2. t. 49. *Ribas* and *rivash* of the Affghans and Persians, much celebrated among them, and much esteemed on account of the agreeable acid of its leafstalks. The root is said to be *rawund.* It is the *Riwas* of Serapion, who mentions it as making a good sherbet. It is said also to be found on the mountains of Syria.

6. R. Rhaponticum, *Linn.* Alpin Rhapont. i. t. 1. Nees von E. 113-14-15. Borders of the Euxine, and on the north of the Caspian Sea, Deserts near the Volga, and in Siberia, as it is known to yield Siberian Rhubarb. Supposed to have yielded the Rhabarbarum of the ancients. Cultivated in this country on account of its stalks, and extensively at Banbury on account of its roots, and also at Rheumpole near Lorient, in the department of Morbihan in France.

7. R. crassinervium, *Fischer.* Sent from St. Petersburgh to the Apothecaries' Garden at Chelsea. Roots large, and said to have the colour and odour of Turkey Rhubarb.

8. R. leucorrhizum, *Pallas.* R. nanum, *Sievers.* Ledebour, Il. Pl. Ross. t. 492. Found in the deserts of the Kirghis, and South of Siberia, and Altai Mountains. Said to yield *White or Imperial Rhubarb.*

9. R. undulatum, *Linn.* Amœn. Acad. iii. t. 4. Nees von E. 116, 117. St. and Ch. 177. Lindl. Fl. Med. p. 357. A native of Siberia, Tartary, and China? Seeds of what was called the genuine Rhubarb plant were given to Kauw Boerhaave by a Tartar merchant, and these seeds produced this species and *R. palmatum.* This is said to be cultivated in France as one of those yielding French Rhubarb.

10. R. caspicum, *Fischer.* Caspian Shores and Altai Mountains. Lindl. p. 557.

11. R. compactum, *Linn.* Mill. Dict. 218. Nees von E. 121. A native of Chinese Tartary, said to yield some of the Rhubarb cultivated in France, which forms a fair imitation. Valued in this country on account of its stalks.

12. R. palmatum, *Linn.* This species is easily distinguished from the others by its roundish, cordate, half palmate leaves, with the lobes also deeply cut. Root large, branched, brown externally, of a deep yellow internally. Supposed to be a native of the mountains of Mongolia near the great wall of China. The seeds of this were received by K. Boerhave with those of *R. undulatum* as those of the genuine Rhubarb; and it is thought, when cultivated in Europe, to resemble Chinese-Russian Rhubarb more closely than any other kind, in taste, odour, internal structure, and the action of some chemical reagents.

R. HYBRIDUM, *Murray*, is a doubtful species, but is remarkable for the great size of its roots as cultivated both on the Continent and in this country. This plant, with R. Rhaponticum, compactum, and emodi, with hybrids from them, are those most commonly cultivated in this country on account of their stalks.

The greater part of the Rhubarb of commerce grows in Chinese Tartary, on the mountains and plains surrounding Lake Kokonor, near Thibet (*Pallas and Rehman*), especially in the province of Gansun, and is gathered in summer from plants of six years of age. When dug up, it is cleansed, peeled, cut into pieces; these are bored through the centre, strung on a string, and dried in the sun. In the autumn it is brought to Sinin, where the Bucharian traders reside, and from thence sent to the Russian frontier town of Kiachta, and to Pekin, Canton, Macao. Considerable care is bestowed at the Russian factory in examining and separating the good from the inferior pieces, and from impurities; and in paring the Rhubarb to remove remaining portions of the bark, also the upper part of the root; and in perforating all pieces so as to examine their interior, because many, though sound externally, soon decay internally; it is supposed from over-rapid drying. The author, however, found most old roots of R. Webbianum more or less decayed. It is collected in quantities of 40,000 pounds before it is imported into the European parts of Russia, packed first in bags, and placed where there is a free current of air,—afterwards in chests.

1. *Russian*, called also *Turkey Rhubarb*, but which in Russia is called *Chinese Rhubarb*, is imported into the frontier town of Kiachta, and thence sent to Moscow and St. Petersburgh, whence it is distributed to the rest of Europe. It varies in shape, being irregularly roundish, and angular, from the bark having been shaved off with a knife; some pieces are cylindrical, a few flattish, many pierced with holes. Externally it is smooth, of a yellow colour; internally, the texture is rather dense; the fracture is uneven, irregularly marbled with white and red veins; it has a strong and peculiar, slightly aromatic odour, a bitter, rather astringent taste, feels gritty when chewed, tinges the saliva yellow, and produces a powder of a bright yellow colour. Mr. Quekett obtained from 35 to 40 per cent. of raphides, or conglomerated crystals of oxalate of Lime, which are situated within the cells, and which are the cause of the grittiness experienced when Rhubarb is chewed. This is the best kind of Rhubarb.

2. *Bucharian Rhubarb*, which makes its way to Vienna by Brody and Nischny, seems, from specimens and information afforded by Mr. Faber to Dr. Pereira, to consist of inferior kinds of the above Rhubarb, much of which, as inferred by the latter, would be burnt, if presented to the Russian authorities; it therefore finds its way into Europe by other channels. It is intermediate between the Russian and the Chinese Rhubarbs, and is generally of inferior quality.

3. *Chinese*, sometimes called *East India Rhubarb*, consists of two

or three varieties. 1. One called by Dr. Pereira *Dutch-trimmed*, or *Batavian Rhubarb*, and, according to the shape, called *Flats* or *Rounds* in the trade, is closely allied to, and is derived, with very little doubt, from the same sources as the Russian Rhubarb; some of which, as mentioned above, finds its way to Canton, and is thence imported into Europe, or first into one of the Indian ports, and thence re-exported to Europe. It resembles the above in appearance, as the cortical portion appears to have been sliced off, and not scraped. The holes with which the pieces are perforated often contain within them pieces of the string by which they had been strung together. 2. Another variety, which is more particularly called *Chinese*, or *East India Rhubarb*, also *half-trimmed*, is distinguished from that called Russian, as being irregular in shape, never angular, but with the edges rounded, as if the bark, instead of being sliced, had been scraped off, often some of it still remains adherent; the roots are besides, of less uniform good quality than the Russian. Externally they are of a duller yellow; many of the pieces are heavier from being more compact; the reticulation is less regular, and of a yellowish-brown colour. 3. A third variety has been described by Dr. P. under the name of *Canton Stick Rhubarb.* This is in *cylindrical* pieces, about two inches long, and from half to three-quarters of an inch in diameter. These are probably produced in the mountains which bound China, as those of the province of Sechuen, and perhaps of Kansu.

These three kinds of Rhubarb are all produced within the limits of the Chinese Empire, and are therefore included under the term *Rheum Sinense*, adopted by the L. C.

4. *Siberian Rhubarb.* Small quantities of this kind have been imported by Mr. Faber, and have been proved to be those called by Grassman and others *Siberian Rhapontic Root.* This occurs in long, thin, almost cylindrical or spindle-shaped pieces, decorticated and perforated by a hole. Colour, externally pale yellow, internally brownish yellow, or reddish-white. Odour and taste of good Rhubarb, but weaker; does not feel gritty. Dr. Pereira compares it with English *Stick Rhubarb* (*v.* P. J. iv. 448 and 500). It has since been proved (P. J. vi. p. 74) that the Rhubarb cultivated at Banbury is yielded by the same species, that is *Rheum Rhaponticum.*

5. *Himalayan Rhubarb.* This is produced by different species, and is of very different quality. That yielded probably by *R. Moorcroftianum*, given to the author by Major Hearsey, the companion of Mr. Moorcroft, was of a bright but light yellow colour, and, as stated by the author in 1827, "appeared both in sensible qualities and medical virtues to equal the best Rhubarb that he had ever seen." (*Trans. Med. Soc. of Calcutta*, iii. p. 439.) The Rhubarb of *R. Webbianum* was tried by the author in both the Military and the Civil Hospital at Saharunpore, and found to be of very good quality. Some of it

was subsequently submitted by the Medical Board to the late Mr. Twining, for experiment in the General Hospital at Calcutta. After trial in 43 cases, he reported that in doses of ℈j. or ʒß. it has a good purgative effect, operating nearly as freely as the best Turkey Rhubarb; and further, that the effects of small doses of the remedy, as a tonic and astringent, are highly satisfactory; also, that it "is very efficacious in moderate doses for such cases as Rhubarb is generally used to purge." After a further trial in 4 other cases of Diarrhœa, he reports, "If further experiments should confirm the efficacy of the Himalaya Rhubarb in such cases, the acquisition of this remedy to the Materia Medica of this country will be of the utmost importance." (l. c. p. 445).

This Rhubarb differs much in appearance from that of commerce. The bark, of a brownish colour, has not been taken off. The texture is radiated, rather spongy, the colour a yellowish-brown, the powder of a dull brownish-yellow colour, having little aroma (though when fresh dried, the root was described as aromatic by Mr. Twining), with a bitter and rather astringent taste. The author selected the branches of the roots, for he found the root-stock generally decayed in the centre. They were cut into short pieces, and slung upon string for the facility of drying. Some of the Himalayan Rhubarb is probably yielded by *R. Emodi*, and perhaps by other undiscovered species of Nepal, and of the passes towards Bootan. Their value must be decided by their medical effects in the cases for which they are suited, and not by their differing in appearance from the roots of other species.

6. *English Rhubarb.* This is cultivated at Banbury, in Oxfordshire, to the extent of twenty tons annually, and is the produce of *Rheum Rhaponticum* (*v.* P. J. vi. p. 75). It is the kind frequently sold by men dressed up as Turks as Turkey Rhubarb. The pieces vary in shape, some being ovoid, others cylindrical (*English Stick Rhubarb*), smoothed externally, and rubbed with a yellow powder; light, rather spongy, with a reddish hue. It is rather mucilaginous in taste, and a little astringent. Its odour is feeble, but unpleasant. It is supposed that much of this is employed for adulterating the Asiatic Rhubarb when in a powdered state (*v.* P. J. vi. p. 74 and 76).

The chemistry of Rhubarb cannot yet be considered to be in a satisfactory state. But from the investigations of various observers it may be concluded that this root contains :

1. *Rheine*, a peculiar neutral principle, called by various other names, supposed by some to be the active constituent, and metamorphosed by oxidizing agents into *Erythrosic acid*.

2. Three acrid resins, discovered by Schlössberger, yellowish in colour, differing in their solubility in ether and alcohol, and named *Aporetine*, *Phæoretine*, and *Erythroretine*. The last produces with an alkali a purple solution.

3. *Tannic* and *Gallic* acids, with *bitter extractive.* The two acids are found most in the reddish veins which traverse the root.

4. Crystallized *Oxalate of Lime.* This is deposited as Raphides in the cells of the root; and is contained in the largest quantity in Russian, in the least in English Rhubarb.

5. A minute quantity of *Volatile Oil* gives the peculiar odour.

6. *Starch*, *Sugar*, and *Lignine*, are found in this root, as in most vegetable tissues. The starch grains of Rhubarb, as seen under the microscope, are exceedingly small.

Dr. Michaelis considers Rheine to be tonic, and the purgative property of Rhubarb to consist in the combination of Resin with Oxalate of Lime. He found 100 parts of Russian Rhubarb to contain *Rheine* 4·3, *Resins* 10·3, *Ox. Lime* 15·2, *Astringent extractive* 14·7, *Woody fibre* 14, and the rest Starch and water. English Rhubarb yielded about the same amount of Rheine, about half as much each of Resin and Ox. Lime, and twice as much extract and woody fibre.

Rheine, called also Rhabarbarine and Chrysophanic acid, has been lately investigated by M. Dulk, M. Garot, and Mr. Cobb. It may be separated from the infusion by Lebourdais' Charcoal process (*v.* Digitaline). It is a neutral bitter substance. It occurs in minute yellow prismatic crystals, fused by a gentle heat, and at a higher temperature partly sublimed, partly decomposed. It is slightly soluble in water; soluble in ether and in hot alcohol; insoluble in alkaline solutions. *Erythrosic acid* is often deposited slowly from Tincture of Rhubarb. It is supposed to be produced by the action of the oxygen of the air upon Rheine. It may be obtained in a purer state by digesting strong Nitric acid upon Rhubarb, when an insoluble orange powder is produced, which, after being well washed in water, may be separated by means of ether or hot alcohol into Erythrosic acid and an insol. residue. This acid produces a deep and splendid carmine solution when neutralized by a solution of an alkali. By this result of its oxidation, Rheine, or Rhubarb itself, may be easily recognized chemically.

The active principles of Rhubarb are taken up by water, either cold or hot, as also by Proof Spirit. The Alkalis produce generally a red coloured solution with Rhubarb (on account of the presence of oxidized Rheine, or of Erythroretine ?). The Acids cause a precipitate in its infusion, as also does Gelatine. Sesquichloride of Iron causes a green-coloured precipitate. Tincture of Iodine produces a tawny muddiness.

Action. Uses. Cathartic, also mildly astringent and Tonic. It causes considerable muscular action of the intestines, and produces fæcal rather than watery evacuations. The cathartic is followed by an astringent effect, which makes it particularly valuable in cases of Diarrhœa, where it first evacuates and then strengthens the intestinal canal. In small doses it acts as a Stomachic and Tonic. Its colouring matter is readily absorbed, and may soon be detected in the urine. It is much used as a Laxative for children, especially in combination

with Magnesia, sometimes with Calomel, and is equally suitable as a Purgative in cases of Diarrhœa, with an antacid and aromatic, or in cases where a mild Cathartic is required.

D. Of the powder gr. x.—℈j.

PULVIS RHEI COMPOSITUS, E. D. Comp. Rhubarb Powder.

Prep. E. Mix thoroughly *Magnesia* ℔j., *finely powdered Ginger* ℥ij., and *finely powdered Rhubarb* ℥iv. Preserve in well-closed bottles. D. Similar.

Action. Uses. Laxative and Antacid; well known as *Gregory's Powder.* In doses of ℈j.—ʒj. For children, gr. v.—gr. x.

PILULÆ RHEI, E. Rhubarb Pills.

Prep. Beat into a proper mass *finely powdered Rhubarb* 9 parts, *Acet. Potash* 1 part, *Conserve of Red Roses* 5 parts. Divide into 5 gr. pills.

Action. Uses. Aperient in doses of gr. x.—gr. xv.

PILULA RHEI COMPOSITA, L. E. D. Comp. Rhubarb Pill.

Prep. L. Mix *powdered Rhubarb* ʒiv., *powdered Aloes* ʒiij., *powdered Myrrh* ʒij. Then rub into a proper mass with *Soft Soap* ʒß., *Oil of Caraway* ♏xv., *Treacle* q. s.

E. D. Similar: *Oil of Peppermint* instead of Caraway.

Action. Uses. Cathartic in doses of gr. x.—℈j. Well suited to a sluggish state of the bowels.

PILULÆ RHEI ET FERRI, E. Rhubarb and Iron Pills.

Prep. Beat into a proper mass *dried Sulph. Iron* 4 parts, *Extr. Rhubarb* 10 parts, *Conserve of Red Roses* 5 parts. Divide into 5 gr. pills.

Action. Uses. Tonic and Aperient in doses of gr. x.—gr. xv.

EXTRACTUM RHEI, L. E. D. Extract of Rhubarb.

Prep. L. Macerate for 4 days *powdered Rhubarb* ℥xv. in *Proof Spirit* Oj. and *Aq. dest.* Ovij. Strain. Set by for the dregs to subside. Pour off the liquor and evaporate to the proper consistence.

E. Cut Rhubarb ℔j. into small pieces, macerate in *water* Oiij. for 24 hours, filter through cloth, express moderately, macerate the residue with Aq. Oij. for at least 12 hours, filter through the same cloth, and express strongly. Filter again, if necessary, and evaporate to the due consistence in the vapour-bath. The Extract may be obtained of fine quality by evaporation in vacuo with a gentle heat. D. Similar to E.

Action. Uses. Cathartic in doses of gr. x.—ʒß. A good preparation may be obtained with cold water and percolation when Spirit is unnecessary (*c*); and a still better one evaporated in vacuo, as recommended in the E. P.

INFUSUM RHEI, L. E. D. Infusion of Rhubarb.

Prep. L. Infuse in a covered vessel for 2 hours in boiling *Aq. dest.* Oj., *Rhubarb sliced* ʒiij. Strain.

D. ʒij. to f℥ix.

E. Three times as strong; contains also *Spirit of Cinnamon.*

Action. Uses. Aperient and Stomachic in doses of f℥jß. repeated. A good preparation may be made with cold water and percolation.

VINUM RHEI, E. D. Rhubarb Wine.

Prep. Digest for 7 days coarsely powdered *Rhubarb* ℥v., coarsely powdered *Canella* ʒij., in *Proof Spirit* f℥v., and *Sherry* Oj. and f℥xv. Strain; express strongly the residue. Filter.
D. Similar: strength as 3 to 5.

Action. Uses. Stomachic in doses of fʒij. Purgative f℥ß.—℥j.

TINCTURA RHEI COMPOSITA, L. D. Tinct. Rhei, E. Comp. Tinct. of Rhubarb.

Prep. L. Macerate for 7 days *cut Rhubarb* ℥ijß., *bruised Liquorice* ʒvj., *cut Ginger* and *Saffron* āā ʒiij., in *Proof Spirit* Oij. Strain.
E. Mix powdered *Rhubarb* ℥iijß. and bruised *Cardamoms* ℥ß. Proceed by percolation with *Proof Spirit* Oij. as in Tinct. Cinchona. Or prepare by digestion.
D. Similar to L.; contains no *Ginger*, and *Cardamoms* ℥j.

Action. Uses. Cordial, Stomachic in doses of fʒj. Purgative f℥ß.—f℥j.

TINCTURA RHEI ET ALOES, E. Tincture of Rhubarb and Aloes.

Prep. Mix powdered *Rhubarb* ℥jß., *Socotrine* or East Indian *Aloes* powdered ʒvj., bruised *Cardamoms* ʒv., and with *Proof Spirit* Oij. Proceed as for Tinct. Cinchona.

Action. Uses. Warm Cathartic in doses of f℥ß.—f℥j.

TINCTURA RHEI ET GENTIANÆ, E. Tinct. of Rhubarb and Gentian.

Prep. Mix powdered *Rhubarb* ℥ij., powdered or finely cut *Gentian* ℥ß., and with *Proof Spirit* Oij.—proceed as for Tinct. Cinchona.

Action. Uses. Stomachic in doses of fʒj. and Aperient in f℥ß. —f℥j.

THYMELÆÆ, *Juss.* (*Daphnoideæ.*) Daphnads.

They are found in the central parts of the temperate zones, and in mountainous situations, and are remarkable for the tenacity and lace-like appearance of their bark, as well as for its acridity.

MEZEREUM, L. E. D. Daphne Mezereum, *Linn.* Radicis Cortex, L. Root-Bark, E. D. Mezereon. *Octandria Trigynia*, Linn.

This plant is supposed to be included with *Daphne oleoides* under the χαμέλαια of Dioscorides. It is called *Mazrioon* in Persian works on Materia Medica and *Khamela* assigned as its Greek name.

Mezereon (fig. 85) is a small shrub. Leaves lanceolate, tapering below, smooth, evergreen. Flowers subternate, lateral, arranged in a spike-like manner, appearing before the leaves, rose-coloured. Perianth 4-fid, segments ovate-acute, tube hairy. Stamens 8, short, inserted (1) in the tube of the perianth in two rows. Ovary (2) oval, oblong, with a short style and peltate

stigma. Berry bright-red, fleshy, 1-seeded (*v.* 3, where some of the sarcocarp has been removed, to show the seed).—Woods of central Europe, less common in Great Britain; cultivated in gardens as an ornamental shrub.—Nees von E. 125. St. and Ch. 65.

D. Gnidium (Fr. *Garou*) *D. Laureola,* Spurge Laurel, and other species, are also employed on the continent. The bark of the latter forms much of what is used, even in this country, for Mezereon.—Squire, P. J. i. 395.

Fig. 85.

All parts of the plant are more or less acrid. The bark of the root is officinal in the Pharmacopœias, and is the most efficacious part. It is tough and fibrous, as in all Daphnes: it is met with in strips which are of a light greyish colour externally, whitish and shining within; when fresh dried it has a slight but peculiar odour. The taste, especially of the inner part of the bark, is hot, acrid, and durable, though at first a little sweetish. These properties are imparted to water, Alcohol, Oils, and Vinegar. It contains a neutral crystalline principle, *Daphnine*, which is said to be devoid of activity. The active properties are owing to a peculiar *acrid resin*, and to an *acrid volatile oil*, which is described as highly irritant. The berries, according to Pallas, are employed as Cathartics, but in large doses will prove poisonous.

Action. Uses. Epipastic. A piece of the bark moistened in vinegar, and applied to the skin, and renewed, will produce a blister. Guibourt recommends an Ointment as a substitute for Savine Ointment. It is also a Stimulating Diaphoretic and Diuretic, but chiefly used as an ingredient of the Decoction of Sarsaparilla.

DECOCTUM MEZEREI, D. Decoction of Mezereon.

Prep. Mix *Mezereon* in chips ʒij., *bruised Liquorice Root* ʒß., in *Aq.* Oij. Boil down to Ojß. Strain.

Action. Uses. Diaphoretic in doses of f℥ij. 3 or 4 times a day; but most of the active principle is dissipated during the boiling.
Pharm. Prep. Decoctum Sarsæ Compositum, L. E. D.

MYRISTICEÆ, *R. Brown.* Nutmegs.

The Myristiceæ resemble *Laurineæ* in properties. By Dr. Lindley they were placed near *Anonaceæ,* which they resemble in the structure of their flower and seed, ruminate albumen, and position of embryo. He now places them in his Alliance Menispermales, in connection with which may be mentioned an interesting fact, first noticed by Dr. Falconer, that is, that the seeds of *Spærostemma grandiflorum* have the albumen remarkably aromatic, nearly as much so as Nutmegs, which in aroma and taste they closely resemble when bruised or chewed. Myristiceæ are found within the tropics of Asia and America.

MYRISTICA, L. E. D. Myristica officinalis, L. E. (*M. Moschata.* Thunb., D.) Semen putamine nudatum, L. Seed, or Kernel of the fruit, E. D. *Diœcia Monadelph.* Linn.

Nutmegs, being the produce of the distant Spice Islands, were probably first known to the Hindoos (Sans. *Jae-phul*, Java-fruit ?), and through them to the Arabs, being the *jouz-al-teeb* or fragrant nut of Avicenna. The Dutch long endeavoured to confine the Nutmeg to three of the small Banda Isles. But when these were in the possession of the English from 1796 to 1802, Dr. Roxburgh brought away and introduced numerous plants into the English settlements of Bencoolen and Penang, and into the Calcutta Botanic Garden. The Nutmeg has also been introduced into the Mauritius, French Guiana, and West India Islands. It is now grown extensively at Singapore. Nutmeg and Clove-trees have both flowered at Syon House.

The Nutmeg-tree (fig. 86) is about 25 to 30 feet high, with some resemblance to a Pear-tree. Leaves faintly aromatic, alternate, sub-bifarious, with short petioles, oblong, somewhat obtuse at the base, acuminate, glabrous, above dark-green, paler beneath. *Male.* Racemes axillary. Flowers small, yellowish, the pedicels of each supported by a minute bract. Calyx (1) urceolate, 3-toothed. thick and fleshy, with short reddish pubescence. Filaments (1 and 2) united into a thick, oblong, and obtuse column. Anthers (2) about 9 (9 pairs, *Roxb.*), linear-oblong, attached round the upper part of the filamentous column, 2-celled, free at their base, opening longitudinally (3). *Female* (4). Peduncles usually solitary, axillary. Perianth much as in the male. Ovary ovate. Style short. Stigma 2-lobed, persistent. Fruit pyriform or nearly spherical, about the size of a peach. Pericarp fleshy, splitting from the apex into two equal, thick, fleshy, astringent valves, and displaying the deep-orange or scarlet-coloured *arillus* or *Mace,* which, cut into many irregular denticulate stripes, embraces the nut so tightly as to impress it with superficial furrows. Nut (5) ovoid, attached by a large umbilicus to the bottom of the cell; its shell is hard, of a dark brownish-

black colour, and glossy, with its inner coat of a light-brown colour, thin, but spongy, closely investing the seed. *Seeds* or *Nutmegs* conform to the shell, and consist chiefly of albumen, into which the inner coat of the shell dips deeply, giving it a variegated, brownish-veined, or *ruminated* appearance (6); while fresh they are rather soft, juicy, and more fragrant than after being dried. Embryo at base of albumen (6), erect, patelliform. Cotyledons 2, thick, fan-shaped, margins irregularly cut (7). Plumule of 2 unequal lobes. Radicle inferior, hemispherical.—Roxburgh chiefly, Fl. Ind. iii. p. 844. Corom. Plant. iii. t. 267. Nees von E. 133. St. and Ch. 104.

Fig. 86.

At Bencoolen the tree generally fruits at the age of 7 years, and continues productive for a long period. The trees being monœcious and diœcious, a large number turn out barren when they are raised from seed.

Nutmegs are imported chiefly from Sumatra and the Spice Islands. A few other species yield aromatic nuts, as *M. tomentosa*, sometimes

called Wild or Male Nutmegs: *M. Otoba* in South America.* Nutmegs are imported generally without their shells, and with the *Mace* separated from them. Both are carefully dried in the sun, and the nuts often dipped in milk of lime to protect them from the depredations of insects. They are roundish or ellipsoidal, the finest rather small and heavy, marked externally with a network of furrows, internally of a light reddish-grey colour, marked with darker coloured veins. The odour is agreeably aromatic; the taste warm, a little bitter, but gratefully aromatic. 500 parts analysed by Bonastre, were found to contain of Volatile Oil 6 per cent., Stearine or solid fatty matter 24, Elaine or liquid oil, coloured, 7·6, Acid 0·8, Starch 2·4. Gum 1, and Lignin 54 per cent. The dark veins especially contain the oily matter. The active parts are taken up by Alcohol and Ether.

MACE (*Macis*), as seen in the fresh Nutmeg, or in wet preserved specimens, is of a deep-orange or crimson colour; in a dry state, it is of a yellow or dull-orange colour; in flat, irregularly cut, somewhat horny, but also brittle pieces. It has the odour and taste of Nutmegs, and when analysed yields the same principles, that is, a volatile oil by distillation and a fixed oil by pressure; so that its active properties are soluble in Alcohol and Ether. Mace is not officinal.

Action. Uses. Nutmegs and Mace are both Aromatic and Stimulant; in large doses Narcotic. Both are employed as Condiments, but Nutmegs are used as an adjunct to many officinal preparations.

MYRISTICÆ OLEUM E SEMINE EXPRESSUM, L. Myristicæ adeps, E. Butter of Nutmegs, commonly but erroneously called *Expressed Oil of Mace.*

Butter of Nutmegs is an ingredient of the Emp. Picis, L. E., otherwise it is little used. It is imported from the Moluccas, being prepared there by partially heating and subjecting Nutmegs to pressure. It is solid, in brick-shaped cakes, of an orange-colour, with the odour of Nutmegs. It contains a little Volatile Oil, a fluid Elaine; and another fatty principle, which is solid and crystallizable, melts at 118°, and contains *Myristic acid* ($C_{28}\ H_{27}\ O_3 + H\ O$) in combination with Glycerine.

Action. Uses. Emollient and slightly Stimulant as an Embrocation.

OLEUM MYRISTICÆ, E. D. Volatile or Essential Oil of Nutmegs.

Obtained by distilling with water *Nutmegs* reduced to powder. Usually imported of a pale yellow colour, with the odour and taste of Nutmegs. Sp. Gr. 920—948. This after a time deposits crystals of Stearoptene, the Myristicine of some authors. The true Volatile Oil of Mace is similar in nature and properties.

Action. Uses. Stimulant in doses of ♏j.—♏iij.

* Some nutmegs are longer in shape than others. In the English tariff the round nutmegs imported have been charged at a rate of duty six times higher than the long ones, from the notion that the former are "cultivated," and the latter "wild." But Mr. Crawford states that both are alike in quality, produced by the same tree, and found both in the wild and cultivated states, whereas the long *Wild Nutmegs* of the Malays are produced by other species (as M. fatua, &c.), and are destitute of aroma. (P. J. xi. 514.)

Essentia Myristicæ Moschatæ, D. Essence of Nutmeg.

Prep. As Essentia Carui.

Spiritus Myristicæ, L. E. D. Spirit of Nutmeg.

Prep. L. Mix bruised *Nutmegs* ℥ijß. in *Proof Spirit* Cj. and *Aq.* Oj. Distil Cj. over a slow fire. E. D. Similar.

Action. Uses. Aromatic Stimulant. Used as an adjunct in doses of f ʒj,—fʒiv.

Laurineæ, *R. Brown.* Laurels.

The Laurineæ, from the structure of their anthers, are allied to *Atherospermeæ* and to *Gyrocarpeæ:* from the *Thymelææ* they are easily distinguished by their structure. They have been well elucidated by Nees von Esenbeck. In their red-coloured juice, and *aromatic* properties, they resemble *Myristiceæ.*—Tropical regions of Asia and America, with two species extending to the north of Africa and south of Europe.—*Enneand. Monog.* Linn.

Laurus, L. Laurus nobilis, *Linn.* Fructus, the Fruit. Laurel or Sweet Bay. *Enneandria Monog.* Linn.

This is the Δάφνη of the Greeks. From its leaves having been employed in making chaplets for their gods and crowns for their heroes, it was called *Laurus nobilis* by Linnæus. It is the *ghar* of the Arabs, and probably the *Ezrach* of the Bible. (*v.* Bibl. Cycl. i. p. 692.)

Evergreen (fig. 87) from 15 to 25 feet high, with dense leafy branches. Leaves oblong, lanceolate, acute, wavy at the margin, hairless, with the exception of a fine beard and small pore at the axils of the lower veins. Umbels 4—6 flowered, (1.) axillary, supported by scarious concave scales. Flowers diœcious, yellowish, dotted with fine glands. Perianth 4-parted (2). Fertile Stamens 12 in 3 rows, the external alternating with the segments of the perianth. Filaments each with 2 glands at, or above, the middle. Anthers oblong, 2-celled, all looking inwards, opening with 2 turned-up valves (3). Female flowers with 2 to 4 castrated stamens. Stigma capitate. Berry ovoid, about the size of a field-bean, bluish-black, single-seeded. Cotyledons large, oleaginous, convex on the back.—North of Asia Minor; common in Mediterranean region; shrubberies in England.—Nees von E. t. 132.

Lauri Folia. Laurel leaves are not now officinal. They must be carefully distinguished from the poisonous leaves of the Cherry Laurel, p. 446. They have a fragrant odour, and an aromatic, rather bitter taste. These properties they owe chiefly to the presence of a yellow-coloured Volatile Oil, which may be separated by distillation with water.

Lauri Fructus, L. Laurel Berries (*hab al ghar* of the Arabs) are oblong, ellipsoid; when dry of a dark-brown colour, with a wrinkled, friable sarcocarp, covering the two oval fatty cotyledons. They contain a warm, fragrant, Volatile Oil, which may be obtained by distillation with water, and about $\frac{1}{4}$ of a greenish-coloured fat, which may be separated by expression.

Oleum Lauri expressum, or Oil of Bays, is obtained by pressure with the aid of heat, both from the fresh and the dry drupes of the Bay tree. It is imported from the South of Europe. Like the Butter of Nutmegs, it contains a Volatile Oil, Elaine, and Stearine.

Fig. 87.

Action. Uses. Aromatic Stimulants, but not much used now. The infusion of the leaves is Diaphoretic. Oil of Bay may be used as a stimulant Embrocation.

Pharm. Prep. Confectio Rutæ, L.

SASSAFRAS, L. E. D. Sassafras officinale, *Nees.* Radix, the Root, L. D. Root, Wood, and Volatile Oil, E.

Sassafras was discovered by the Spaniards in Florida in 1528, but is common throughout the United States. The name is considered to be a corruption of Saxifrage (*De Theis*). Sassafras nuts have nothing to do with this plant, but are probably the fruits of a Nectandra.

A small diœcious tree, but growing to a great height in favourable situations, with a trunk about a foot in diameter. Bark rough, furrowed, greyish-coloured,

but the twigs smooth, and bright green. Leaves alternate, petiolate, downy when young, membranous, varying much in form and size, some being oval and entire, others with a lobe on one side only, the generality 3-lobed, but all tapering into the petiole. Flowers slightly fragrant, of a pale yellowish-green colour, racemose, with deciduous subulate bracts. Perianth 6-parted. Stamens 9, the 3 inner with a thick stipitate gland on each side. Anthers linear, 4-celled, all looking inwards. Female flowers usually with fewer sterile stamens, the inner often all united together. Drupe oval, about the size of a large pea, of a deep-blue colour, placed on the thickened apex of the reddish-coloured peduncle, surrounded by the cup formed by the remains of the perianth.—North American woods from Canada to Florida. Flowers in May in the north, but earlier in the south.—Nees von E. 131. St. and Ch. 126.

Sassafras Wood is light, porous, and fragile, whitish in the young, and reddish in the old tree, but feebly aromatic, and seldom employed in America. The Bark is sometimes separated.

The *Root* is more efficacious, and is usually seen in irregular and branched fragments; wood of a brownish-white, light and porous; bark brittle, spongy, in layers of a rusty cinnamon hue; fresh exposed surfaces of a lighter colour; sometimes covered with a brownish epidermis. Dr. Reinach has lately analysed the *Bark of the Root* of the Sassafras, in which he found, as was to be expected, a much larger proportion of the active principle than in the Wood. He found of Heavy and Volatile Oils ·8, Fatty matter ·8, Resin and Wax 5, *Sassafrid* (a peculiar principle) 9·2, Tannin 5·8, Sassafrid with Tannin and Gum 6·8, Albumen ·6, Gum, Colouring matters, &c. 3, Starch with reddish-brown Colouring matter 5·4, Starch with Tannin, &c. 28·9, Lignin 24·7 = 100 parts.

The odour is pleasantly fragrant, its taste sweetish and gratefully aromatic, dependent on the presence of a Volatile Oil. The properties are yielded to hot water as well as to Alcohol; but the Volatile Oil will necessarily be dissipated, if much heat is employed.

Sassafras Pith is described by American writers as in slender, very light, and spongy pieces; mucilaginous in taste, with a slight flavour of the Sassafras; forming a limpid mucilage with water, which is much used as a demulcent. The leaves even are said by Dr. Lindley to be used in Louisiana for thickening soup, from containing much mucilage.

Action. Uses. Stimulant; Diaphoretic in infusion; but chiefly used in combination.

Pharm. Prep. Decoct. Guaiaci, E. Decoct. Sarzæ Comp.

Oleum Sassafras, E. Volatile Oil of Sassafras.

Prep. Distil bruised Sassafras Root, wood, and bark, with water.

A light yellow-coloured Oil; Sp. Gr. 1·094; with Sassafras-odour and pungent taste. It appears to be composed of two oils, one of which swims, the other sinks in water. After a time it deposits a Stearoptene.

Action. Uses. Warm Stimulant in doses of ♏ij.—♏v.: It is one

of the Oils recommended to be added to the Fluid Extract of Sarsaparilla, E.

Camphora, L. E. D. Camphora officinarum, *Nees*. Concretum e ligno sublimatione comparatum, purificatum, L. Camphor.

Camphor is a principle found in many plants, but only in two in any great abundance. One of these, (Dryobalanops,) which yields none of the Camphor of European commerce, has been mentioned at p. 338. The other is a Chinese and Japanese plant. Camphor, like several substances the produce of countries to the southward or eastward of India, was unknown to the ancients. (Hindoo Med. p. 93.) It was known to the Arabs, and called by them *Kaphoor*.

The Camphor tree is an evergreen, grows to a considerable size, is straight below and branched. All parts emit a camphoraceous odour when bruised. Wood white, fragrant, much used in China for making trunks, boxes, &c. Branches somewhat lax, smooth, with a greenish bark. Leaves alternate, with long petioles, ovate-lanceolate, rather coriaceous, smooth, shining, and bright-green above, paler beneath, triple-nerved, with a sunken gland opening by a pore beneath, at the axils of the principal lateral veins. Leaf-buds scaly. Flowers small, hermaphrodite, smooth externally, in naked, axillary, and terminal corymbose panicles. Perianth 6-cleft, with a deciduous limb. Fertile stamens 9, in 3 rows, the 3 inner supported at the base by 2 stipitate compressed glands. Anthers 4-celled, opening by as many ascending valves, the 3 interior looking outwards, the others opening inwards. Three sterile stamens subalternate with those of the second row, three others stipitate, each with an ovate head. Drupe situated in the truncate cup-like base of the perianth.—Native of China, principally near Chinchew in the province of Fokien; also of Formosa and Japan.—Nees von Esenb. 130. St. and Ch. 129.

Camphor is diffused through all parts of the plant, and is separated from the root, trunk, and branches, which, being cut into chips, are first boiled in water, and then sublimed into inverted straw cones contained within earthen capitals. It is thus obtained in the form of *Crude Camphor*, chiefly from the province of Fokien in China and the opposite island of Formosa, but some of good quality is also procured from Japan. The Dutch exported from thence into Europe 310,520 lbs. in seven years. It is sometimes imported into this country from Batavia. The ordinary Crude Camphor is in small greyish-coloured, slightly sparkling grains, which by aggregation form greyish crumbling cakes, with all the properties of purified Camphor. This is separated from impurities by being mixed with lime and sublimed into thin glass vessels of a certain shape, which being afterwards cracked, the Camphor is obtained in a concavo-convex cake about three inches thick with a hole in its middle.

Camphor is solid, colourless, and translucent, with a crystalline texture, has a strong, penetrating, aromatic odour, and a bitter, rather pungent taste, followed by a sensation of coolness; though brittle, it is not, from its toughness, easily pulverized. Sp. Gr. ·98 to ·99; so that it floats on water, and, evaporating while doing so, undergoes a curious rotatory movement. From its volatility, it evaporates slowly at

ordinary temperatures, and crystallizes on the inside of bottles. It melts at 288°, boils at 400°, burns with a bright flame; is little soluble in water, but easily so in Alcohol, Ether, the volatile and fixed Oils, in Acetic acid, and the dilute mineral acids, in water charged with Carbonic acid, and with the aid of trituration in about 8 times its weight of Milk. Nitric Ether f℥ij. will retain Camphor ℈j. dissolved in f℥iv. of water. (*c.*) Camphor is considered to be an oxide of *Camphogen* ($C_{10}H_8$), or a solid volatile oil composed of $C_{10}H_8O$. The E. C. give as a test of its purity: " Its powder evaporates entirely when gently heated." By long heating with Nit. Acid, Camphor is oxidized and converted into *Camphoric acid.*

Borneo Camphor is in white crystalline fragments, as found in the wood of the *Dryobalanops Camphora.* Sp. Gr. 1·009. Its odour is not of so diffusible a nature, otherwise it closely resembles the above. The Liquid Camphor of the same tree seems to be of the nature of Camphogen. Dr. A. T. Thomson, by passing a current of Oxygen gas through it, converted it into Camphor.

Artificial Camphor, or *Hydrochlorate of Turpentine* ($C_{20}H_{16}$, HCl), remarkably resembles true Camphor in its external properties. It is formed by acting upon Oil of Turpentine with H Cl. It differs from true Camphor in burning with a sooty flame, and in giving off when heated the odour of Turpentine. Mr. Bailey adds the following test. If a fragment be placed on a microscope-slide, and a drop of alcohol added, it will first dissolve, and re-crystallize as the spirit evaporates. Examining this with the aid of polarized light, the small crystals of true Camphor will seem as if beautifully coloured; but not so those of the artificial product.

Action. Uses. The action of Camphor is variously described. Applied locally for a time to any delicate surface, it will act as an irritant. Its action, when taken internally, is chiefly on the nervous system. In moderate doses it will exhilarate, allay nervous irritation, and produce quietude and placidity of feeling. Being absorbed into the system, in large doses, or in particular constitutions, the circulation may be affected by it in a similar way. It afterwards passes off by the skin and bronchial membranes, but not by the urine; the pulse is increased in fulness, and diaphoresis produced, especially if the patient be covered over; consequent relief of febrile symptoms ensues. Sedative effects may succeed to these symptoms. In large doses it acts as a Narcotic, and might be poisonous. It is chiefly useful as a Calmative and Anodyne in various Nervous, especially Hysterical affections, and in Nervous and Typhoid fevers, in doses of gr. v.—gr. x.

MISTURA CAMPHORÆ, L. E. D. Camphor Mixture.

Prep. L. Rub up *Camphor* ʒß. with *Rectified Spirit* ♏x., and gradually add *Aq. dist.* Oj. Filter through linen.

D. *Tinct. Camph.* fʒj. to *Water* Oiij.

E. (Very different.) *Camphor* ℈j, is beaten up with peeled *Almonds* and *Sugar* āā ℥ß. and *Water* Oj.

Action. Uses. The Camphor Mixture of the L. P. is feeble, but has the odour of Camphor, and is a grateful vehicle for more powerful medicines, in many nervous affections, in doses of f℥ij.—f℥iij.

MISTURA CAMPHORÆ CUM MAGNESIA, E. Camphor mixture with Magnesia.

Prep. Rub up together *Camphor* gr. x., *Carb. Magnesia* gr. xxv.; gradually add *Aq.* f℥vj.

Action. Uses. Camphor, by the aid of the Magnesia, is dissolved in larger quantity, but will separate from the water. This, as an antacid, may be more useful in some cases than the above, in doses of f℥ß.—f℥iij.

SPIRITUS CAMPHORÆ, L. Tinct. Camph. E. D. Spirit of Camphor.

Prep. L. Dissolve *Camphor* ℥v. in *Rectified Spirit* Oij.
D. Similar. E. Half as strong.

Action. Uses. For external use, Stimulant and anodyne. (*v.* Linim. Ammoniæ Comp. p. 66). With the aid of Sugar to suspend the Camphor in water, it may be given internally in doses of ♏x.—f℥ß.

TINCTURA CAMPHORÆ COMPOSITA, or Tinct. Opii Camphorata. Paregoric. (*v.* p. 319.)

Paregoric contains Opium gr. i. in f℥ß.

D. fʒß.—fʒiv.

LINIMENTUM CAMPHORÆ, L. E. D.

Prep. L. Rub together in a mortar, and dissolve *Camphor* ℥j. in *Olive Oil* f℥iv.

Action. Uses. Externally as a Stimulant and Anodyne. Commonly called Camphorated Oil. Camphor is also an ingredient of Soap Liniment. (p. 540.)

LINIMENTUM CAMPHORÆ COMPOSITUM, L. D. Compound Camphor Liniment.

Prep. L. Dissolve *Camphor* ℥iiß. and *Oil of Lavender* f℥j. in *Sp. Rect.* f℥xvij., add *Liq. Ammon. fort.* f℥iij., and shake together until mixed.
D. Similar.

Action. Uses. Rubefacient and Stimulant for external use.

CINNAMOMUM, L. E. D. Cinnamomum Zeylanicum. *Nees.* Cortex, L. Bark, E. D. Cinnamon. *True Cinnamon* of the shops.

Cinnamon is the *Kinnemon* of Exod. xxx. 23 (see Bibl. Cycl. ii. p. 210), and the *κιννάμωμον* of Herodotus, a name which he states the Greeks learned from the Phœnicians. The name seems derived from

the Cingalese *Cacynnama* (dulce lignum), or the Malay *Kaimanis*, which Mr. Marshall says is sometimes pronounced *Kainamanis*. (*v. Antiq. of Hind. Med.* 84 and 141.)

Fig. 88.

The Cinnamon tree of Ceylon (fig. 88) is about 30 feet high. The root has the odour of Cinnamon as well as that of Camphor, and yields this principle upon distillation. The twigs are somewhat 4-cornered, smooth, shining, and free from any downiness. The leaves are liable to variation, being ovate, or ovate-oblong, terminating in an obtuse point, triple or three-nerved, that is, there are three principal nerves, which sometimes remain separate to the very base, but usually approach each other a little above the base, but without uniting; there are, moreover, in many cases, two shorter nerves external to these. Leaves reticulated on the under side, smooth, shining, the uppermost the smallest, with a good deal of the taste of cloves. The leaf-buds are naked. Panicles terminal and axillary. Flowers usually bisexual, rather silky. Perianth 6-cleft

(2), segments oblong, the upper part deciduous. Fertile stamens 9, in 3 rows, the 3 inner with 2 sessile glands at the base (6). Anthers ovate, 4-celled (4—6), the 3 interior opening outwards. 3 abortive capitate stamens (staminodia) in the interior of all. Ovary 1-celled, with a single ovule. Stigma disk-like. Drupe (or berry) 1-seeded, seated in the cup-like six-lobed base of the perianth (7). Seed large, with large oily cotyledons (8—10); embryo above.—Native of Ceylon, now cultivated elsewhere, as on the Malabar coast, in Java, Cayenne, &c.—Nees von E. as Laurus Cinnamomum 128. St. and Ch. 121.

Cinnamon is cultivated in plantations situated on the south-west of the island of Ceylon, between Negombo and Matura, where the soil is nearly a pure quartzose sand, the climate damp, showers frequent, and the temperature high and equable. (*Dr. Davy.*) Trees may be cut when six or seven years old. Branches three years old, or those which are from half an inch to three inches in diameter, are selected and lopped off, commencing in May and continuing till October. The bark is divided by longitudinal incisions,—of which two opposite to each other are made in the smaller shoots, several in the larger,—and then peeled off in strips. After twenty-four hours, the epidermis and the green matter under it are scraped off, after the strips of bark have been placed on a convex piece of wood. The bark soon contracts into the form of quills, which are about forty inches in length, of which the smaller are introduced within the larger ones, forming the ordinary rolls of Cinnamon. They are dried first in the shade and then in the sun, and sorted into Cinnamon of different qualities, known in commerce as first, second, and third Cinnamon. It is imported chiefly from Ceylon; some also from Tellicherry on the Malabar coast, probably grown at Anjarakandy. (*v.* p. 418, and Buchanan's Mysore, p. 546.) Some is also exported from other parts of the Madras presidency, where it was long since introduced by Dr. Anderson, and grown at Tinnivelly, &c. *v.* Roxb. Fl. Ind. ii. p. 296. It has been exported from Quilon. *v. Cassia.*

Besides Cinnamon, Oil of Cinnamon is made at the plantations; and from the ripe fruits a fatty substance called *Cinnamon Suet* is expressed, which the author supposed to be the *Comacum* of Theophrastus. (*Antiq. of Hind. Med.* p. 546.) He finds it noted in Rheede, *Hort. Mal.* i. p. 110.

Ceylon Cinnamon of the best quality is in long and slender cylindrical bundles, about forty inches in length, composed of numerous quills rolled up within one another, each about the thickness of cartridge paper, smooth, pliable, breaking readily with a splintery fracture, and easily powdered. The colour of the bark is a dull, yellowish-brown, now usually called a Cinnamon colour. The surface is intersected by pale glistening fibrils. It has a pleasant, grateful odour, a warm, sweetish, and very agreeable taste. Besides the three qualities of Ceylon Cinnamon, it is also imported of different qualities from the Malabar Coast; and Dr. Wight has ascertained that the Cassia of the Indian Peninsula is sometimes exported as Cinnamon. But the Cinnamon plant itself has been introduced into so many

places, that small quantities are occasionally imported from them, as for instance from Cayenne. Some of these are employed for adulterating the superior and more expensive Ceylon Cinnamon. The inferior kinds are thicker, less grateful, and more resembling Cassia. Analysed, Cinnamon is found to contain Volatile Oil (about 6 parts in 1000), Tannin (of the nature of Catechu Tannin), Mucilage, Resin, Colouring matter, Cinnamic acid, and Ligneous fibre.

Action. Uses. Aromatic and Stomachic, slightly Astringent. The most grateful of condiments, and much used as an ingredient of chocolate. The powder in doses of gr. v.—℈j. will check Nausea, relieve Flatulence, and some Cramps. Much employed in combination in Diarrhœas; in low states of the constitution; and as a constituent of various preparations.

Pharm. Prep. Infusum Catechu Co. Decoct. Hæmatoxyli, E. Elect. Catechu. Confectio Aromatica. Pulv. Cretæ Comp. Pulv. Kino Comp. Tinctura Catechu Co. Tinct. Cardamomi Comp. Tinct. Lavand. Comp. Sp. Ammoniæ Arom. Acid. Sulphuric. Arom. Vinum Opii.

Pulvis Cinnamomi Compositus, L. Pulvis Aromaticus, E. D. Compound Cinnamon or Aromatic Powder.

Prep. L. Rub up into very fine powder *Cinnamon* ℥ij., *Cardamoms* ℥jß., *Ginger* ℥j., *Long Pepper* ℥ß.
E. *Cinn.*, *Card.*, *Ginger*, equal parts.
D. *Cinn.*, *Ginger*, āā ℥ij., *Card.*, *Nutmeg* āā ℥j. (*v. Conf. Aromat.*)

Action. Uses. Aromatic Stimulant in doses of gr. v.—℈j.

Electuarium Aromaticum, E. Aromatic Electuary.

Prep. Of the above *Aromatic Powder* 1 part to be triturated with *Syrup of Orange-peel* 2 parts. This, though similar to the *Aromatic Confection*, L. D. (p. 122), in the nature of the spices, differs in not containing any Chalk.

Action. Uses. Carminative in doses of gr. x.—ʒß.

Oleum Cinnamomi, L. E. D. Oil of Cinnamon.

This Oil is imported from Ceylon, being obtained by macerating the powdered rejected bark in a saturated solution of salt, and then distilling. The water which passes over is milky, from holding the Oil in suspension; but this soon separates. About 8 ounces are obtained from 80 ℔s. of recently prepared Cinnamon. Some of it is heavier and some lighter than water.
In Mat. Med. of L. P., defined as *Oleum e cortice destillatum.*

The E. P. gives as its characteristics: "Cherry-red when old, wine-yellow when recent; odour purely cinnamonic. Nitric′ (concentrated, added drop by drop) converts it nearly into a uniform crystalline mass (a compound of the acid and of the oil)." The colour varies according to age. Oil of Cassia is often substituted for it; other adulterations are used, which the Nitric′ detects by producing a less distinct effect. Oil of Cinnamon is remarkable for its grateful aroma and spicy cinnamonic taste, less pungent and acrid than that of Oil of

Cassia. The essential part of Oil of Cinnamon is a limpid fragrant compound called *Hydruret of Cinnamule* ($C_{18}\ H_7\ O_2 + H$). But by exposure to the air this combines with oxygen, and produces *Cinnamic acid* ($C_{18}\ H_7\ O_3$) and two peculiar resins. Cinnamic acid consists of Cinnamule+O. It may also be obtained by distilling the Balsams of Tolu and of Peru. By powerful oxidizing agents this acid may be converted first into Bitter Almond Oil, and then into Benzoic acid. (*v.* Fownes, P. J. iv. 264.)

An Oil distilled from the leaves of Cinnamon is sometimes exported to Europe, and sold under the name of *Oil of Cloves*.

Action. Uses. A grateful but powerful Stimulant in doses of ♏j.—♏iij. Much used for flavouring, by cooks and confectioners.

Essentia Cinnamomi, D. Essence of Cinnamon.

Prep. As Essentia Anisi.

Aqua Cinnamomi, L. E. D. Cinnamon Water.

Prep. L. Prepared as Aq. Anethi. E. As Aq. Cassiæ. D. As Aq. Anisi.

Action. Uses. Carminative, but chiefly used as a vehicle in doses of f℥jß.—f℥iij. It is made with greater facility with the Oil, and is sometimes prepared by diffusing the Oil through water by means of Sugar or Magnesia. But as Cinnamon water made from the Oil is much more apt to spoil, from the formation of Cinnamic acid, distillation from the bark is the preferable method.

Spiritus Cinnamomi, L. E. Spirit of Cinnamon.

Prep. L. Dissolve *Oil of Cinnamon* ʒij. in *Proof Spirit* Cj.
E. Take *Cinnamon* in coarse powder ℔j. Proceed as for Spir. Caraway.

Action. Uses. Stimulant adjunct in doses of fʒj.–fʒiij. to draughts.

Tinctura Cinnamomi, L. E. Tincture of Cinnamon.

Prep. L. Take *Cinnamon* powdered ℥iijß., *Proof Spirit* Oij. Macerate for 7 days, and strain.
E. Proceed by percolation or digestion, as directed for Tinct. Cassia.

Action. Uses. Grateful adjunct (fʒj.—fʒiv.) to draughts.

Tinctura Cinnamomi composita, L. E. D. Compound Tincture of Cinnamon.

Prep. L. Macerate for 7 days *bruised Cinnamon* ℥j., *bruised Cardamoms* ℥ß., *Long Pepper* ground ʒijß., *Rasped Ginger* ʒijß., in *Proof Spirit* Oij. Filter.
E. Similar proportions. Best prepared by percolation, as Compound Tincture of Cardamoms. D. Twice as strong.

Action. Uses. Aromatic adjunct to Astringent and other draughts, in doses of fʒj.—fʒij.

Cassiæ Cortex, E. Bark of Cinnamomum aromaticum, *Nees.* (C. Cassia, *Blume,* Laurus Cassia, *Linn.*) and of other species. Cassia bark.

Cassia is mentioned by early Greek writers; in the Bible by the name *Kiddah;* (*κιττώ* is one kind of Cassia in Diosc. i. c. 12). It is

translated Cassia in Exod. xxx. 24 (*v.* Kiddah, and Kinnamon, *Bibl. Cycl.* and *Antiq. of Hind. Med.* p. 84).

Cassia bark, called also *Cassia lignea*, is imported from China, and from the Malabar coast of India, as was shown at length by the author in the first edition of this work. The Chinese Cassia is produced by *Cinnamomum aromaticum*. Cassia buds, which are aromatic, and have some resemblance to cloves, are exported from China, and probably yielded by the same plant.

CINNAMOMUM AROMATICUM, *Nees v. Esenb.* A tree of considerable size. There is one 18 feet high in the Edinb. Bot. Garden. Branches angular, twigs and petioles covered with down. Leaves often nearly opposite, though usually alternate, oblong-lanceolate, acute at each end, triple-nerved, or with three nerves which unite into a single nerve above the insertion of the leaf-stalk, and disappear towards the apex of the leaf; the nerves are, like the twigs, covered with broken (strigulose) downiness, with curved veinlets on the under surface. Panicles narrow, silky.—This is the *C. Cassia* of Blume, introduced from China, and the *Laurus Cassia*, t. 3. of the brothers Nees in their paper on the Cinnamon, also of Hort. Kewensis, ii. p. 427, and the Laurus Cinnamomum of Andrew's Repos. t. 595, often quoted 596. The leaves taste mucilaginous and Cinnamonic (*c*). Dr. Lindley says that as grown in stoves they are almost insipid, mucilaginous, and somewhat astringent. I have received a specimen of this plant (named *Cinnamomum chinense*) from the Messrs. Loddiges, who inform me that it was imported by their house from China in 1790. This is probably the source of the various plants in hot-houses. The leaves taste mucilaginous, but also aromatic.

Cassia, though it bears a considerable resemblance to Cinnamon, is usually in single quills, seldom more than double, from $\frac{1}{4}$ to $\frac{1}{2}$ or even 1 inch in diameter. It is thicker, rougher, more dense, breaks with a shorter fracture, and is of a darker red colour than Cinnamon, and its powder of a reddish-brown tint. Its taste is more pungent and stronger, but not so sweet and grateful as that of the *true* Cinnamon, and its odour is less agreeable. That from China is now always stripped of its epidermis.

That Cassia cannot consist merely of inferior kinds of Ceylon Cinnamon, as has been supposed by some, is sufficiently proved by the fact that the latter has, until recently, paid an export duty of 3*s.* a pound, whereas Cassia, even in England, is barely worth 1*s.* a pound.

Some true Cinnamon is certainly exported from the Malabar coast of India. Dr. Wight states that he has found among the specimens furnished to him from thence the true Cinnamon-tree (C. Zeylanicum). He considers that all sorts of Cinnamon-like plants, yielding bark of a quality unfit to bear the designation of Cinnamon, are passed off as Cassia. Mr. Huxham, of Quilon, also states, that the only difference between Malabar Cassia and Malabar Cinnamon is, that the former is coarser and thicker than the latter. Both are obtained from the same tree, the Cassia being the bark of the larger parts of the tree, and the Cinnamon being peeled from the younger shoots and small branches.

Cassia lignea, analysed by Bucholz, yielded of Volatile Oil 0 8,

Resin 4·0, Gummy Extractive 14·6, Bassorin with Ligneous fibre 64·3, water and loss 16·3=100. But as Sesquichloride of Iron and Gelatine both produce precipitates with it, that of the former of a dark-green colour, it must also contain Tannin. Its active properties, dependent chiefly on the volatile oil, are taken up by Spirit, and partially by water, as in the preparations.

Action. Uses. Aromatic Stimulant, in doses of gr. x.—ʒß.

Oleum Cassiæ, E. Oil of Cassia.

The Volatile Oil of Cassia-bark, obtained by distillation, with water, is imported from Singapore, and is still probably all produced by the Chinese Cassia or Cinnamon, C. aromaticum.

Cassia Oil, when pure, has a pale wine-yellow colour, which does not deepen with age. (*c.*) Sp. Gr. 1·095. It has in a remarkable degree the Cassia odour and taste. Like Oil of Cinnamon, it absorbs Oxygen, and is converted into Cinnamic acid. Nit′ also converts it into a mass of crystals, in which the oil appears to be combined with the acid. It appears in all essentials to resemble the Oil of Cinnamon, and though not so grateful, is often sold for Oil of Cinnamon.

Action. Uses. Stimulant Carminative in doses of ♏j.—♏v.

Aqua Cassiæ, E. Cassia Water.

Prep. Mix bruised *Cassia* ℥viij., *Rectified Spirit* f℥iij., *Aq.* Cij. Distil off Cj.

Action. Uses. Carminative vehicle, and used as Cinnamon-water.

Spiritus Cassiæ, E. Spirit of Cassia.

Prep. With powdered *Cassia* ℔j. proceed as for Spir. Caraway.

Tinctura Cassiæ, E. Tincture of Cassia.

Prep. Digest powdered *Cassia* ℥iijß. in *Proof Spirit* Oij. for 7 days; strain, express strongly, and filter. Or more conveniently prepare by percolation, previously macerating the Cassia in the Spirit for 12 hours.

Action. Uses. Stimulant adjuncts to draughts in doses of fʒj.—fʒiv.

Bebeerine. Alkali of Nectandra Rodiei, *Schomburgk.* Greenheart Tree.

A considerable quantity of a wood called Greenheart is imported into this country for ship-building from Guiana and the West Indian islands. It is large in size, heavy, hard, durable, takes a polish, but is apt to split, and is of different tints of olive-green, varying from pale to dark.

Sir R. Schomburgk (Hooker's Journ. of Bot. Dec. 1844) has described the tree which yields this timber. It is a new species of the Laurels, belonging to the genus *Nectandra*, and has been named *N. Rodiei.* In 1834 attention was first directed to the bark of this tree as possessing valuable febrifuge properties.

The bark of the Bebeera tree occurs in large flat pieces, is about four lines in thickness, heavy, and with a rough fibrous fracture, of a dark cinnamon-brown colour, rather smooth within, but covered externally by a splintering greyish-brown epidermis. It has little or no aroma, but a strong, persistent, bitter taste, with considerable astringency. It contains, in addition to Tannic acid, a peculiar bitter alkaloid, the presence of which was first indicated by Mr. Rodie, R.N., in compliment to whom the tree was named. It was afterwards described at length by Dr. Maclagan, and may be prepared in the same way as Quina from Cinchona bark.

Pure *Bebeerine* does not crystallize. It is very soluble in Alcohol, less so in Ether, and very sparingly in water. Heated, it fuses, and the heat being continued, it swells up, giving off vapours of a strong peculiar odour, and burning without residue. Subjected to the action of oxidizing agents, it gives with Bichromate of Potash and Sul′ a black, and with Nit′ a yellow Resin. It forms with acids, salts which are all uncrystallizable; with Perchloride of Gold, Mercury, Copper, Iron, and Platinum, it gives precipitates which are soluble to a certain extent in hot water and Alcohol, but which, on the solution cooling, are not deposited from it in a crystalline form. Messrs. Maclagan and Tilley obtained for it the formula $C_{35}H_{40}NO_6$.

Dr. M. obtained Bebeerine from Warburg's Fever Drops. But there has since appeared reason to suppose that this secret nostrum often, if not always, contains Quinine.

The above authors observe as remarkable that this alkaloid should be isomeric with Morphia, which acts as a pure narcotic. The atomic constitution of Morphia, calculated by Liebig and Regnault from their analyses, agrees with that given above for Bebeerine. But it should be observed, that Dr. Planta has since analyzed Bebeerine again, and calculated for it a different formula, viz., $C_{38}H_{21}NO_6$. The confirmation of this equivalent would entirely destroy the supposed isomerism.

Action. Uses. Tonic, Antiperiodic, Febrifuge. It resembles Sulphate of Quinine in its action and uses, as has been ascertained by Dr. Christison and others. It is, however, less powerful. It is given in 2 or 3 grain pills every hour, or three or four times a day, according to the case, so that ℈j. or so may be given before the accession of a paroxysm, or it may be given in gr. x. doses, morning and evening. It is sometimes used in the form of the Sulphate of Bebeerine.

Aristolochieæ, *Juss.* Birthworts.

They are chiefly found in hot countries, though a few species extend to northern latitudes. They secrete a bitter principle and Volatile Oil.

Asarabacca. The leaves of *Asarum Europæum*, a native plant, are possessed of very irritant properties, and have been used as Errhine. It used to be collected near Kirkby Lonsdale in Westmoreland.

SERPENTARIA, L. E. D. Aristolochia Serpentaria, *Linn.* Radix; the Root. Virginia Snake-root. *Gynandria Hexandria*, Linn.

Several species of Aristolochia were employed by the ancients, and still are so on the Continent, as well as in Asia. The officinal species was probably first brought to notice as a *Snake-root* to settlers in America. It is first mentioned in Johnson's edition of Gerard's Herbal.

Rootstock perennial, roundish, with numerous root-fibres; throwing up several herbaceous stems 8 to 10 inches high, slender, flexuose, jointed at irregular distances, often of a reddish colour at the base. Leaves alternate, shortly petioled, cordate, acuminate, smooth, and of a pale yellowish-green colour, a little downy beneath. The peduncles are produced on the stem, but near the root, nearly unifloral, with one or more bracts. The perianth is tubular, contorted like the letter S, inflated at its two extremities, its throat surrounded by an elevated ridge, and its border expanded into a broad irregular margin, forming an upper and under lip. The anthers 6, attached to the sides of the fleshy style, which is situated in the bottom of the perianth, covered by the spreading 6-lobed stigma. Capsule obovate, 6-angled, 6-celled, with many flat seeds.—A native of the middle, Southern, and Western States of North America. The root is collected in Western Pennsylvania, and Virginia, in Ohio, Indiana, and Kentucky. Nees von E. 143. St. and Ch. 180.

American writers state that the roots of two other species, *A. tomentosa* and *A. hastata*, are also collected. The latter is closely allied to *A. serpentaria*, the other climbs to the tops of tall trees; but their roots are said scarcely to differ from those of *A. serpentaria.* The roots of *Spigelia marylandica* are also sometimes found intermixed. Nees von Esenbeck, moreover, mentions a species, *A. officinalis*, Med. Pfl. t. 144, which may be only a variety of *A. serpentaria.*

Virginia Snake-root is in tufts of long, slender, frequently interlaced, and brittle fibres, attached to a short, contorted, knotty head or caudex. The colour, which in the recent state is yellowish, becomes brown by time. The smell is strong, aromatic, and like Camphor and Valerian; the taste warm, very bitter, and camphorous. The root yields its virtues to water, to Alcohol, and to Proof Spirit. The active ingredients are probably the Volatile Oil and a bitter Extractive, which is also acrid, and was detected by Chevallier and Bucholz.

Action. Uses. Stimulant Tonic, Diaphoretic, and Emmenagogue in doses of gr. x.—ʒß. In large doses it causes nausea and purging. Used to be employed in cases of atonic fevers, &c., and in Exanthemata, where the eruption is tardy in appearing, or has receded.

Pharm. Prep. Tinctura Cinchonæ Comp. L. E. D. Electuarium Opii, E.

INFUSUM SERPENTARIÆ, L. E. Infusion of Snake-root.

Prep. Macerate *Serpentaria* ℥ß. in boiling *Aq. dest.* Oj. for 4 hours in a covered vessel. Strain.

Action. Uses. Diaphoretic in doses of f℥jß. every two or three hours.

TINCTURA SERPENTARIÆ, L. E. Tincture of Snakeroot.

Prep. L. Take bruised *Serpentaria* ℥iijß. and *Proof Spirit* Oij. Macerate for 7 days, and strain.

E. Proceed by percolation or digestion, as for Tinct. Cinchona. *Cochineal* ʒj. is added.

Action. Uses. Stimulant adjunct to Tonics and Diaphoretics in doses of from fʒj.—fʒij.

Euphorbiaceæ, *Adr. de Jussieu.* Spurgeworts.

They abound in tropical countries; many species, however, are found in the southern parts of the temperate zone, but in the northern only herbaceous species, with Buxus as a shrub. The Euphorbiaceæ are remarkable for acridity, which is contained in the milky juice; hence some are used as local, and some as general stimulants; others are poisonous in nature. A few secrete Volatile Oil in the bark, as Cascarilla; and others, fatty oil united with acrid principle in their seeds, as in Castor and Croton oils. The roots of Janipha Manihot secrete fecula and acrid principle, which latter is dissipated by heat.

The *Stillingia sebifera*, or Tallow-tree, belongs to this order, and is cultivated very extensively in some parts of China. It is valued for the white sebaceous matter that envelopes its seeds, which, containing both Stearine and Elaine, is a true *Vegetable Tallow.*

Tribe *Ricineæ*, *Adr. de Jussieu.*

Croton, *Linn.* *Monœcia Monadelphia.*

Flowers monœcious, or very rarely diœcious. Calyx 5-parted. *Males.* Petals 5. Stamens 10 or more, distinct. *Females.* Petals none. Styles 3, divided into two or more partitions. Capsule tricoccous. *Adr. de J.*

Cascarilla, L. E. D. Croton Eleuteria, *Swartz*, L. E. D. Possibly also other species of the same genus, E. Cortex; the Bark. Cascarilla.

Cascarilla was first made known by V. Garcias Sabat in 1692. The name, signifying a little bark, is applied by the Spaniards to a variety of barks, particularly several kinds of Cinchonas. It is intended in the Pharmacopœia to indicate a bark known for 150 years, which Dr. Pereira has shown comes principally from the Bahamas, and which Dr. Lindley has proved (Fl. Med. p. 179) to be the produce of *Croton Eleuteria* of Swartz, and not of *Croton Cascarilla*, of Don, for this yields Copalchi bark.* Nees von Esenbeck has also shown that *C. micans* of Swartz, a Jamaica plant, yields some of the Cascarilla of the Continent. Both these plants are figured in the Pfl. Med. of Nees Suppl. t. 22.

The *C. Cascarilla* of Linnæus (*C. lineare* of Jacquin) the *Wild Rosemary bush* of Jamaica, does not appear to yield any bark like Cascarilla, or to have the sensible properties of that bark.

(The new genus *Cascarilla* belongs to the order *Cinchonaceæ*; it yields one kind of Carthagena bark, and the bark called *Quinquina nova.*)

* It is probable that *C. Cascarilla* yields not only the *Copalchi bark* of Mexico, but also the bark known as *Natri* in Chili and Peru. In each of these countries it is very highly esteemed as a tonic, being considered as superior even to Cinchona bark in the treatment of some of the tropical fevers. (Dr. Stark.)

Croton Eleuteria forms a small tree. Branches and twigs angular, rather compressed, striated, downy, ferruginous. Leaves stalked, alternate, ovate, with a short but obtuse point, green on the upper surface, silvery and densely downy beneath. Flowers monœcious. Racemes axillary and terminal, branched. Males uppermost and smallest; females below, few, and on short stalks. Filaments 10 to 12. Ovary roundish. Styles 3, bifid. Stigmas obtuse. Capsule roundish, minutely warted, about the size of a pea, with 3 furrows, 3 cells, and 6 valves. *Lindley.*—Thickets of Jamaica and other West India Islands.—This species, having the name of Eleutheria, from one of the Bahamas, has been proved by Dr. Lindley, from information and authentic specimens from the Bahamas, to yield the true Cascarilla bark, as had been before stated by Drs. Wright and Woodville.—Nees von Esenb. t. 139. St. and Ch. 150.

Cascarilla may be confounded not only with Copalchi, but also with that kind of Cinchona called Grey or Huanuco bark. It consists, however, of irregular fragments, which are thin, two to three, sometimes four inches in length; they are moderately quilled, a little twisted, or flat, about the thickness of a pencil or that of the little finger; of a greyish colour externally, much fissured, covered in many parts with a whitish lichen; the substance of the bark of a brownish colour, and its internal face smooth. It is compact; the fracture short, brittle; the powder of a light-brown colour. It has a weak though aromatic odour; the taste is bitter, a little acrid, and spicy. M. Duval in recently analysing it, found it to contain Albumen, Tannin, a Bitter crystallizable substance (*Cascarilline*), Red Colouring matter, Fatty matter with a nauseous smell, Wax, Gum, Volatile Oil with an agreeable smell, Resin, Starch, Pectic acid, Chloride of Potassium, Salts of Lime, Woody Fibre. *Cascarilline* when pure is white and crystalline, without odour, has a bitter taste, which, however, is not at first perceptible from its sparing solubility; but it communicates its bitterness to a large quantity of water. It is very soluble in Spirit and Ether, and appears to be a non-azotised neutral substance of the nature of Salicine. The properties of the bark no doubt depend chiefly on the Volatile Oil and the Cascarilline. These are taken up by Spirit, and partially by water.

Action. Uses. Stimulant Tonic; has been considered Febrifuge, and may be advantageously prescribed with Cinchona. It is chiefly employed in Dyspepsia and in other complaints requiring a warm Tonic.

D. Of the powder gr. x.—℈jß.; may be given with Soda in Milk.

INFUSUM CASCARILLÆ, L. E. D. Infusion of Cascarilla.

Prep. L. E. Macerate for 2 hours in a covered vessel powdered *Cascarilla* ℥jß. in boiling *Aq. dest.* Oj. Strain.

D. ℥j. to Oß.

Action. Uses. A light warm Tonic in doses of f℥jß.

TINCTURA CASCARILLÆ, L. E. D.

Prep. L. D. Take *powdered Cascarilla* ℥v., *Proof Spirit* Oij. Macerate for 7 days and strain.

E. Same prop.: proceed by percolation or digestion, as for Tinct. Cinchonæ.

Action. Uses. Stimulant and Tonic adjunct to draughts in doses of f℥j.—f℥ij.

Tiglii Oleum, L. D. (*Crotonis Oleum*, E.). Croton Tiglium, *Linn.* Oleum e Semine expressum, L. Expressed Oil of the seeds, E. D. Croton Oil.

The seeds, called *Jamalgota*, were given to the author when in India as the *dund* of the Arabs. They were, no doubt, employed at those times, as well as subsequently in Europe, under various names, as *Grana Tilli*, also *Tiglia*, &c., and the wood *Lignum Moluccense.* Having passed out of practice, they were re-introduced by the notices of Dr. White and of Mr. Marshall, published in Ainslie's Materia Medica of India, and by a publication of Mr. Conwell.

Croton Tiglium forms a small tree, of 15 to 20 feet in height, with the young branches smooth and roundish. Leaves oval-oblong, acuminate, 3—5 nerved, with shallow glandular serratures, thin, membranous, with 2 glands at their base, the younger leaves covered with minute stellate scattered hairs. Petioles short, somewhat angular, with a few stellate hairs when young. Stipules 2, subulate, minute. Racemes terminal, erect, simple, male at apex, female single, below. Flowers downy. *Male,* Calyx 5-cleft. Petals 5, lanceolate, and woolly. Stamens 15 (15 to 20, woolly at base, *Roxb.*), distinct. *Female,* Calyx 5-cleft, permanent. Styles long, bifid. Capsules oblong, obtusely triangular, the size of a hazel nut, closely covered with minute stellate hairs; the cells completely filled with the solitary seeds. Skin of the seeds pale dull-brown, overlying a harder, dark, and smooth integument.—*Hamilton* and *Roxburgh, C. Jamalgota,* Ham. Linn. Trans. xiv. 258.—Indigenous everywhere in Bengal; found also in the Indian Peninsula and in Ceylon; *Lindley,* Fl. Med. p. 181.

Croton Pavana (Ham. *l. c.* p. 258), having ten stamens, and the seeds much smaller than their cells, is another species, which yields what Dr. Hamilton considers to be the original Tiglium seeds. It is a native of Burmah, Assam, and Silhet, perhaps also of Amboyna.

Croton Roxburghii, Wall. (C. polyandrum, *Roxb.*) is a native of the Circar mountains; it bears seeds to which the name *Jamalgota* is also applied.

The *Croton Tiglium* has a disagreeable smell, and the taste of the leaves is exceedingly nauseous and permanent. (*Roxb.*) All parts of the plant seem provided with an acrid purgative principle, but the seeds alone are officinal, as yielding the Oil. These are each about the size of a grain of Coffee, oblong, rounded at the extremities, with two faces, the external more convex than the internal, separated from each other by longitudinal ridges, and each divided by a similar longitudinal ridge, forming altogether an irregular quadrangular figure. Sometimes, when there are only two seeds in the capsule, the internal surface is flat, with a groove formed by the central axis. The shelly covering of the seeds being sometimes partially removed, they have a mottled appearance; but if entirely so, they are blackish. The kernel is oily, of a yellowish-white colour when fresh, but becoming brownish by age. It has a large embryo, with leafy cotyledons. In India the seeds with their coverings are subjected to torrefaction, and the

embryo usually separated before they are prescribed medicinally. In Europe their effects are obtained by prescribing the Oil, commonly called *Croton Oil.* This is prepared by bruising the kernels, and subjecting them to pressure, when about 50 per cent. of Oil may be obtained. But some Oil is also imported from Ceylon. According to Dr. Nimmo, the seed consists of 64 parts of kernel and 26 of covering, and the kernels yield 60 per cent. of Oil. Both albumen and embryo contain some of the acrid principle.

The analyses of Pelletier and Caventou, and of Brandes, displayed a trace of Volatile Oil, *Crotonic acid*, which is acrid and volatile, Fixed Oil,—*Crotonine*, an alkaline and crystalline body (since shown to be only a fatty salt of Magnesia); Resin, Gum, Albumen and Gluten, Salts, Lignin, &c. The active properties have been supposed to depend on the *Crotonic acid*, which passes off with the fixed oil, whether this is separated by expression or by being dissolved in Ether. But Dr. Pereira doubts whether this acid in its pure state possesses any active properties; and Mr. Redwood has found, on experiment, that both Crotonic acid and its salts are inert.

Action. Uses. Croton seeds are powerfully Cathartic, and in very common use in India as Purgative Pills, commonly called *Jamalgota Pills.* The natives usually separate the embryo, and combine the albumen of the seed with Catechu or Pepper. About a grain, or half a seed, is sufficient for a dose, though they often take larger doses.

TIGLII OLEUM. Croton Oil.

Expressed from the seeds. Imported from India, chiefly from Madras and Bombay, but also from Ceylon. Also made in England.

Croton Oil, when quite pure and fresh, is nearly colourless, but as usually met with, it is rather viscid, yellowish, and even of an orange-colour, from over-roasting of the seed. It has a faint but peculiar smell, and a permanent acrid taste, which is most felt in the throat. The Oil is soluble in Ether, as well as in the volatile and fixed oils. The E. P. gives a test of its purity: "when agitated with its own volume of pure Alcohol, and gently heated, it separates on standing, without having undergone any apparent diminution." Castor Oil, which is the only oil likely to be used in adulterating it, is soluble in Alcohol. But Dr. Pereira has ascertained that this test is an incorrect one. He has examined both kinds of the commercial oil; the *East Indian*, which is pale in colour; and the *English*, which is of a dark brown, and more energetic than the other. When the latter, which is probably the purest, is shaken with an equal bulk of pure Alcohol, an uniform mixture or solution is obtained, which does not separate at all, unless artificial cold be applied. When the *E. Indian* oil is treated in the same manner, a milky mixture is formed, which, on a gentle heat, becomes limpid. After about 24 hours this does separate into two strata, but the separation is not complete; for the lower

stratum, which is largest, consists of oil holding some Alcohol in solution, and the upper one of Alcohol containing some oil. (Dr. P. thinks it possible that the E. I. Croton Oil may be adulterated with *Jatropha Oil.* But the author has seen Croton Oil made in India from the blanched seeds, which, though necessarily pure, was quite pale in colour.)

Action. Uses. Drastic Purgative in obstinate Costiveness and torpid state of the Intestinal canal, or when a Hydragogue, or the speedy action of a Cathartic, is required. Sometimes is very useful in nervous disorders, as in Tic Douloureux. Rubbed on the skin, it acts as a Rubefacient, and is frequently employed as a Counter-Irritant to relieve internal affections, either in its pure state, or dissolved in twice its bulk of Olive Oil, &c. Bourchardat recommends 20 parts being added to 8 parts of diachylon plaster as a revulsive.

D. As a Purgative ♏j.—♏ij. or ♏iij. made up into pills, to which Opium is sometimes added. The liquid form is objectionable on account of the acrid sensation produced in the throat. *Linimentum Crotoniæ*, D., contains f℥j; of *Croton Oil* to f℥vij. of *Oil of Turpentine.* It is used as a counter-irritant.

RICINI OLEUM, L. E. D. Ricinus Communis, *Linn.* Oleum e Semine calore aut vi expressum, L. Expressed Oil of the Seeds, E. D. Castor Oil Plant. *Monœcia Monadelphia*, Linn.

This plant appears to be the Gourd, or the plant so translated, in Jonah iv. 6, 7, 9, 10. (*v. Kikayon*, in Bibl. Cycl. ii. p. 203.) It is also the *κικι* or *κρότων* of Dioscorides, and its Oil has been employed in medicine from the earliest times by Hindoos, Egyptians, Greeks, and Arabs. The Greek names are taken from the insect called the tick (in Latin *ricinus*) which the seeds resemble.

Different opinions are held respecting the number of species belonging to this genus; but several varieties have no doubt been raised to the rank of species. These are found in Java, and throughout India. One has been named *R. europæa*, but it must have been introduced from the East, and is annual because unable to withstand the cold of winter. The common species may be seen in India, especially at the borders of fields, with stems of considerable thickness, and attaining a height of sixteen to twenty feet, and surviving for many years. The Oil is valued as a medicine, and for burning, and the leaves are used for feeding the Arendy silk-worm.

Root perennial or annual, long, thick, and fibrous. Stems (fig. 89) round, thick, jointed, channelled, hollow, glaucous, of a purplish-red colour upwards. Leaves large, palmato-peltate, deeply divided into 7 lanceolate, serrated segments, on long, tapering, purplish petioles, with glands at the apex of the petiole. Flowers monœcious, in terminal panicles, the lower male, the upper female, all articulated with their peduncles, and sometimes supported by biglandular bracts. Calyx 3—5 cleft, valvate. Petals wanting. *Male.* Stamens numerous, with the filaments branched (*a*) and united below, with distinct globose cells of the anthers (*b*). *Female.* Style 1. Stigmas 3, bipartite (*c*),

plumose, coloured red. Capsule tricoccous, covered with spines, 3-celled (*d*); cells 1-seeded. Seeds pendulous, elongated, ovate, convex externally, somewhat flattened on the inside, of a pale grey colour, but marbled with darker colours (*e*). The seed is covered by a thin, coriaceous, smooth seed-coat, composed of two layers; at its upper end is observed the fleshy swelling which has

Fig. 89.

been termed *Strophiole,* with a delicate white membrane investing the nucleus, which is large, oleaginous, and consists of albumen containing in the middle a large leafy embryo (*f*). Native of India; cultivated in many countries.

Two varieties of Castor Oil seed are known, one large, the other small. The latter is thought to yield more oil, and of a superior quality. Geiger found in 100 parts of these seeds, exclusive of moisture, 23·82 parts of seed covering, and 69·09 of kernel. These 69·09 parts contained 46·19 parts of fixed Oil, 2·40 of Gum, 20·00 of Starch and Lignin, and 0·50 of Albumen. The kernel, when fresh, is of a white colour, and sweetish almond-like taste, which is followed by some acrimony. The Oil may be extracted from the seeds by decoction in water, or by expression, with or without the aid of heat; and for experiment, by the agency of Alcohol. Sometimes the Oil is boiled with water to dissolve out the Mucilage and to coagulate the Albumen. Dr. Christison sums up the result of various papers (by Wright, Boudron, Henry, Bussy, and Guibourt,) by stating — that by simple expression a mild oil of excellent quality may be extracted alike from the small and large varieties of the seed: that when so prepared, it is apt to become sometimes rancid, but may be prevented from doing so if heated to about 200°, so that its Albumen is coagulated and detached: that the embryo is scarcely more active than the Albumen of the nucleus, and that the husk and perispermal membrane are inert: that if the seeds be boiled in the Eastern way, without first roasting them, or driving off the residual water from the Oil by heat, an Oil of fine quality is obtained, which keeps well, but is probably not quite so active: that the active part of the Oil is apparently volatilizable during decoction with water, so that long ebullition may materially impair its energy: and that if the seeds be roasted before being expressed, or the Oil be exposed to a considerable heat, as in the American process, peculiar products are apt to be engendered, which greatly increase the acridity.

Castor Oil is imported in the largest quantities from the East Indies, and this is commonly called *cold-drawn* Castor Oil. Some is expressed from the seeds in England. Some is also imported from North America and the West Indies. It has a pale straw-colour, a faint but unpleasant smell, a mild oily taste, sometimes accompanied with a little acrimony. Though heavier than most fixed oils, it is lighter than water, and viscid. Sp. Gr. 0·969 at 55° F. If exposed to a cold of 32° it deposits a few grains of solid fat. Exposed to the air, it becomes rancid, and dries up. It is soluble in all proportions in both Alcohol and Ether. By the action of Hyponitrous acid upon it, a solid fatty matter is produced, which has been called *Palmine*. It is saponified by alkalis, and is stated by Bussy and Lecanu to contain three fatty acids, each in combination with Glycerine. The acids are *Ricinic*, *Margaritic*, and *Elaiodic*. There is also an *acrid resin*. The solubility of the Oil in its own volume of Alcohol is adopted as a test of purity by the E. C. But Dr. Pereira has shown that Castor Oil (as well as pure Croton Oil) will enable other fixed oils, when mixed with it, to dissolve in Rectified Spirit. So that this test is useless to detect adulteration with another fixed oil, even when to the extent

of 30 or 50 per cent. He has further shown that the oil and spirit exert mutually a solvent action on each other. The solution obtained by mixing equal quantities of Castor Oil and Rect. Spirit, separates after some weeks into two layers, the upper one of spirit holding oil in solution, the lower of oil holding a large quantity of spirit in solution. (*v.* Croton Oil.)

Action. Uses. Purgative. Castor Oil seeds, though mild tasted, even in their fresh state, are acrid.* The Oil is a mild but certain laxative, acting quickly, and is particularly eligible whenever it is wished to produce as little irritation as possible along the intestinal canal. With Oil of Turpentine f℈ij. a particularly efficient purgative may be formed. (*c.*)

D. Of the Oil f℥ß.—f℥jß. swimming on weak Spirit and water, or on hot Milk, Coffee, shaken up with Vinegar, &c. For children, f℈j. or f℈ij. made into an emulsion.

Tapioca, E. D. Janipha Manihot, *Humb. and Bonpl.* Fecula of the Root. *Jatropha Manihot*, Linn. *Manihot utilissima*, Pohl.

Tapioca, first mentioned by Piso in his Nat. Hist. of Brazil, p. 52, is a starch-like substance yielded by the above plant, which has lately been made a member of a new genus, and named *Manihot utilissima* by Pohl.

A shrub, 4—6 feet high. Root large, tuberous, fleshy, and white, with a milky, acrid, poisonous juice. Leaves palmate, 5—7 parted, smooth, glaucous beneath; segments lanceolate, quite entire. Flowers axillary, racemose, monœcious. Calyx campanulate, 5-parted. Petals none Stamens 10. Filaments unequal, distinct, arranged around a disk. Style 1. Stigmas 3, consolidated into a rugose mass.—Adr. de Juss. and Hooker.—Cultivated in the West Indies and in many parts of South America.—B. M. 3071.

Of this plant there are two distinct varieties, one known as the Bitter the other as the Sweet Cassava. The former is about six feet high, the leaves of a darker green, and the stem of a dark-brown colour; the roots are longer in coming to maturity, much larger, about twenty inches in length, and ten in circumference. The juice is acrid and poisonous, owing, it is said, to the presence of Hydrocyanic acid (*Henry* and *c.*), and probably also to an acrid principle. It is cultivated for making the Tapioca of commerce, and Cassava Bread. The latter is made by grating the fresh roots, squeezing out the juice, and then baking into cakes on an iron plate. The Tapioca is prepared by beating the root into a pulp, washing it with cold water, and then allowing the fæcula to subside from the milky fluid which flows from it. Being then dried on heated plates, it becomes of a granular form.

* The author was once called in a great hurry to the hospital-boat when proceeding with a battalion of Artillery up the Ganges, with the statement that several men had been poisoned or seized with cholera. The seeds immediately revealed what the "Indian filberts" were which the men had been picking and eating. The majority recovered rapidly; but three of them suffered severely, and were not discharged from hospital for some time.

By the washing and heating, the poisonous matter, being both soluble and volatile, is dissipated.

The Sweet Cassava (sometimes considered a distinct species, named *Manihot Janipha*, and a third plant distinguished as *M. Aipi*, by Pohl), is about four feet high, the root about a foot in length, and seven or eight inches in circumference, of a light-brown colour. It is very juicy, something resembling chestnuts in taste, and is used as a vegetable either boiled or roasted. But much of it is employed in making a fermented liquor from the root scraped into a pulp, and from which the liquor is squeezed. This is called *Piwarry*, and drunk by the Indians as an intoxicating liquor. (Mr. Gill.)

The irregular grains of which Tapioca consists are about the size of large shot, whitish, and, like other kinds of Starch, without odour or taste. The starch-grains are very minute, but regular and characteristic in form. (See drawing—AMYLUM.) Tapioca has the general characteristics of Starch, of which it is a pure form.

Action. Uses. Dietetical, Demulcent. Much approved of as a diet for the sick-room and for infants at the time of weaning.

Tribe *Euphorbieæ.*

EUPHORBIUM, E. Concrete resinous juice of undetermined species of Euphorbia, E. (*E. Canariensis.*)

EUPHORBIA, *Linn.* *Monœcia Monadelphia*, Linn.

Flowers incomplete, collected into monœcious heads composed of one female and numerous male flowers. Involucre campanulate, with 5 divisions and 5 alternate glands. *Male.* Naked, consisting of a single stamen upon a pedicel, intermixed with scales, surrounding the female. *Female.* A single pistil. Styles 3. Stigmas bifid. Capsule 3-celled, bursting at the back. Seeds solitary, pendulous.—This genus is multiform in habit, some being cactus-like, among which must be the officinal species, having jointed angular stems, with branches of a similar structure, and double prickles at their angles. When wounded, they exude an acrid milky juice, which concretes upon the surface, usually round these prickles, and constitutes the Euphorbium of commerce.

Euphorbium was employed by the early Greek physicians, and is noticed by the Arabs by the name *Furfioon.* The species yielding it is still uncertain. The Euphorbium of the ancients was obtained from Mauritania, that of modern commerce apparently entirely from Mogadore. *E. canariensis*, a plant of the Canary islands, *E. officinarum*, which is said to be found in Arabia and the hotter parts of Africa, and *E. antiquorum*, common in Arabia and all over India, have been adduced by various authorities. The last, the author found comparatively inert. Dr. Pereira, after examining the branches found mixed with the Euphorbium of commerce, came to the conclusion that they belong to *E. canariensis*, a native of northern Africa as well as of the Canaries. He observes that some of the spines found resemble those of the analogous species, *E. tetragona.*

Euphorbium is in irregular shaped tears, usually pierced with one or with two diverging holes, made by the double prickles of the plant on which it had dried. These sometimes remain in the holes. The colour is of a dull yellowish white, something like that of inferior Tragacanth. It is friable, with little odour, but the dust causes violent sneezing, and irritation to the eyes, requiring the face to be well protected; it is very irritant to whatever part it is brought in contact with, and the taste is, after a short period, acrid and burning. It is composed of an Acrid Resin about 60 per cent., of Wax 14, Malate of Lime 12, Malate of Potash 1, Bassorine, probably a little Caoutchouc, Lignin, and water. It is, therefore, a Cereo-Resin, and not a Gum-Resin. It burns with a pale flame and rather an agreeable odour. Water takes up but little of it; Alcohol and Ether are its best solvents. Its active principle is the Resin.

Action. Uses. Powerful Irritant; will produce incessant sneezing, and even bloody discharges; causes ophthalmia if blown into the eyes. An acrid Emetic, Cathartic, and Rubefacient; very dangerous, and seldom used.

Antidotes. Oil, emollient drinks, oleaginous enemata. Obviate inflammation by blood-letting, baths.

PIPERACEÆ, *Richard*. Pepper-worts.

The Piperaceæ are allied in some respects to Polygoneæ, in others to Urticeæ. They are sometimes placed among Endogens, at other times among Exogens. They inhabit the tropical parts of Asia and America, with a few species extending to higher latitudes, and are characterized by pungent and aromatic properties. Besides the officinal species, the Piper Betle is much cultivated and famed for its moderately pungent and aromatic properties, its leaf being employed to envelope the fragments of Areca Catechu, of pale Catechu, and of Lime, which form the famed masticatory of the East, known as Pan or Betle.

PIPER, *Linn.* *Diandria Trigynia*, Linn.

Spike covered with flowers on all sides. Flowers hermaphrodite, each supported by a scale. Stamens indeterminate in number, often two. Anthers 2-celled. Ovary 1-celled. Ovule solitary, erect. Stigma trifid or multifid. Berry 1-seeded. — Shrubs, rarely trees, aromatic, with knotted, jointed branches. Leaves alternate, very entire, often nerved. Spike supported by a spathe at the base, opposite to the leaves, rarely terminal, cylindrical, sometimes subglobular. H. B. and K. This genus has been subdivided by Miquel.

PIPER NIGRUM, L. E. D. Piper nigrum, *Linn.* Fructus immaturus, L. Dried unripe berries of the Black Pepper, E. D. These, decorticated, form *Piper album*, or White Pepper.

The πεπέρι of Hippocrates and Dioscorides is no doubt our Pepper, the name being derived from the Persian *Pilpil*. (*v.* P. longum.) The Hindoos were probably the first to investigate the properties of Pepper. It grows in abundance on the Malabar coast, &c., whence it is now imported, as well as from the Malay Peninsula, Sumatra, and other islands.

The Pepper-vine is a perennial, with trailing or climbing, round, flexuose stem, from 8 to 12 feet in length, dichotomously branched, articulated, swelling near the joints, and often radiating. The leaves are distichous, broadly ovate, acuminate, occasionally somewhat oblique, 5 to 7-nerved, the nerves prominent beneath, connected by lesser transverse ones, of a dark-green colour and glossy above, pale glaucous green beneath. Petioles rounded, nearly an inch in length. Spikes opposite the leaves, stalked, from 3 to 6 inches long, slender, drooping; apparently some male, others female, while sometimes the flowers are furnished with both stamens and pistil. (*Lindl.*) Stamens 3. Fruits distinct, round, sessile, about the size of a pea, at first green, then red, afterwards black, covered by pulp. Native of India and the Indian Islands.—Nees von E. 21. St. and Ch. 174.

Dr. Roxburgh's *Piper trioicum* yields the Pepper of the Rajahmundry Circars, and which he described before he had seen the true *P. nigrum.* But after he had done so, he observed that the leaves of *P. trioicum* have a glaucous appearance, which readily distinguishes it from *P. nigrum*, which has shining dark leaves. Dr. Heyne, who succeeded him in the superintendence of the Pepper cultivation, says that the want of success in culture at Rajahmundry was owing to defects in cultivation, whereby they had *starved* these plants into celibacy. (*v.* Royle, Product. Resources of India, pp. 53 and 67.)

Black Pepper is formed by the above berries, gathered before they are quite ripe, and dried in the sun. They then become black and wrinkled from the drying up of the pulpy part, which covers a round greyish-white coloured seed.

White Pepper is the same berry allowed to ripen, when its pulpy part is easily removed by soaking in water and subsequent rubbing. The dried pulpy covering of the Black Pepper has in this country been removed by mechanical means, to form a white Pepper.

Pepper in both these states has, when bruised, an aromatic smell, and a hot, spicy, pungent taste, which is milder in the white Pepper. These properties are taken up partially by water, completely so by Ether, Alcohol, or Proof Spirit. Analysed by Œrsted and by Pelletier, it was found to contain a peculiar neutral principle, which has been called *Piperine*, an Acrid Resin, a little Volatile Oil, Gum, Starch, Bassorine, Extractive, Malic and Tartaric acids, Salts, and Lignine. Powdered Pepper of the shops is adulterated with Flour, Sago, and other substances. They may be detected by the microscope.

Piperine, when perfectly pure, is in colourless rhombic crystals, neutral and not alkaline, insoluble in water, soluble in Alcohol and Acetic acid, less so in Ether; fusible at 212°, and volatile. Pelletier says, that, when quite pure, it is tasteless, and ascribes any active properties to a portion of the acrid resin. Dr. Christison, however, states, that the very whitest crystals he has been able to obtain were as acrid as those which were brownest, and also that it exists in as large quantity in white as in black pepper, and is there more easily separated, because combined with less resin. It is composed of C_{34}

H_{19} N O_6. It has been recommended as a febrifuge and antiperiodic. It is turned red by Sulphuric acid.

The *Acrid Resin* is soft, becomes solid at 32° F., is soluble in Alcohol and Ether, and unites readily with all fatty bodies. Its taste is extremely pungent and acrid, and it is very abundant in Black Pepper. Some conceive that the properties of Pepper depend chiefly on this Resin.

Action. Uses. Hot stimulant; pungent, grateful Condiment, and as such universally employed; thought to be Febrifuge. Chiefly used to correct the effects of other medicines in causing nausea, &c., in doses of gr. v.

CONFECTIO PIPERIS, L. D. Electuarium Piperis, E.

Prep. L. Rub to a very fine powder *Black Pepper* ℔j., *Elecampane* ℔j., *Fennel Seeds* ℔iij., *Sugar* ℔ij. Keep in a close vessel, and when required, rub up with *Honey* ℔ij.

E. D. Similar; but prepared moist, and *Liquorice root* substituted for Elecampane.

Action. Uses. Moderate Stimulant; has been introduced as a substitute for *Ward's Paste*, which obtained celebrity as a cure for Hæmorrhoids. Sir B. Brodie conceives that it acts on them as a gentle stimulus, in consequence of some of it passing along the colon.

D. ʒj.—ʒij. twice or thrice a day.

PIPER LONGUM, L. E. Piper longum, *Linn.* (*Chavica Roxburghii*, Miquel.) Fructus immaturus, L. Dried Spikes of Long Pepper, E.

Long Pepper has been employed by the Hindoos in medicine from the earliest times. Its Sanscrit name *pippula* seems to have been the original of the Greek πεπέρι, and the πεπερέως ῥίζα would appear to be its roots, which, called *pippula mool*, are still extensively employed throughout the East. (*v.* Hindoo Med. p. 86.)

Root woody. Stems shrubby, climbing, jointed. Lower leaves ovate-cordate, 3—5-nerved; upper ones on short petioles, oblong, acuminate, oblique, and somewhat cordate at the base, obsoletely 4 to 5-nerved and veined, coriaceous, smooth. Peduncles erect, longer than the petioles. Spikes almost cylindrical. A native of the woody hills of the Circars, as well as along the foot of the Himalayas; cultivated in Bengal.—Nees von E. 26. St. and Ch. 174. This plant has been separated by Miquel from the genus *Piper*.

This plant is cultivated both on account of its roots, which, as well as the thickest part of the stems, are cut into small pieces and dried, and form an article of commerce all over the East. The spike of berries forms a long nearly cylindrical body, varying from an inch to an inch and a half in length. The berries are most pungent in their immature state, and are at that time dried, when the whole becomes of a greyish colour. Long Pepper has a faint aromatic odour when bruised, but a powerfully pungent taste. Analysed by Dulong, its composition was found to be analogous to that of Black Pepper, as it contains

Piperine, a concrete Oil, upon which its acrimony depends, and a Volatile Oil, to which it probably owes its odour.

Action. Uses. Stimulant, and a substitute for Black Pepper. It is probably retained in the Pharmacopœia as being a constituent of several old-established preparations, as Pulv. Cretæ Comp., Pulv. Cinnam. C., Tinct. Cinnamomi C., Confect. Opii.

CUBEBA, L. E. D. Piper Cubeba, *Linn*, L. E. (*Cubeba officinalis*, Miquel, D.) Fructus immaturus, pedicillatus, L. Fruit or Berries, E. D. The Cubeb Pepper. *Diandria Trigynia*, Linn.

Cubebs were probably first made known through the Hindoos to the Arabs, being the *kubabeh* of the latter, and the *kubob-chini* of the former. It is not probable that they were known to the Greeks. (*v.* Hindoo Med. p. 85.) Dr. Pereira has adduced evidence that they were employed in England 500 years ago.

Stem climbing; branches round, the thickness of a goose-quill, smooth, rooting at the joints; when young, petioles minutely downy. Leaves 4 to 6½ inches long, 1½ to 2 inches broad, stalked, oblong, or ovate-oblong, acuminate, rounded or obliquely cordate at base, strongly veined, netted, coriaceous, very smooth. Spikes at the end of the branches, opposite the leaves, diœcious, on peduncles the length of the petioles. Fruit rather larger than Black Pepper, globose, on pedicels about half an inch long. (*Lindley.*) A native of Java and Prince of Wales' Island.—Nees von E. 22. St. and Ch. 175.

Dr. Lindley has ascertained that this is the *P. Cubeba* of the Linnean Herbarium. Blume says that the fruits of this, although of good quality, are not sent to Europe, but those that are furnished by *P. caninum*, Rumph. v. t. 28. p. 2; of this the fruit is smaller and shorter-stalked, having a distinct Anise flavour, and less pungent than the fruit of *P. Cubeba*. Dr. L., however, observes, "I cannot perceive any difference in the flavour of the dried fruit of this species and of the Cubebs sold in the London shops." Fl. Med. p. 314.

Cubeb berries, when dried, resemble Black Pepper, but are of a brownish colour, with raised veins forming a network over their surface, and are, moreover, distinguished by having a short stalk; hence Cubebs were called *Piper caudatum* by old writers. The sarcocarp is thin, the shell hard, seed spherical, white, oleaginous. The odour of Cubebs when bruised is aromatic and rather agreeable; the taste warm, peppery, and camphoraceous. Analysed by Vauquelin, and subsequently by M. Monheim, Volatile Oil (v. *Oleum Cubebæ*) was recognised, also, *Cubebine*, which is a neutral substance very similar to Piperine; a soft and acrid Resin, and Extractive. The Volatile Oil, upon which the active properties chiefly depend, will evaporate on exposure, and therefore Cubebs should be powdered only as required. The powder is of a dark colour, and somewhat oily in appearance. It is said to be sometimes adulterated with Allspice powder.

Action. Uses. Stimulant; used as a Stomachic in the East. Having also the power of arresting excessive discharges from the Urethra, it is much employed in Gonorrhœa, for which it is in many cases an effectual cure. It is, perhaps, best prescribed immediately after the

first inflammatory symptoms have subsided; but its use requires caution, as it is apt to create irritation in the Urinary passages, and to cause swelled Testicle.

D. Of the powder, ℈j.—ʒij, three or four times a day.

Oleum Cubebæ, E. Oil of Cubebs.

Obtained from pounded Cubebs by distillation with water, in the proportion of about 10 per cent.

Oil of Cubebs is colourless, or nearly so, lighter than water, thick, with the odour of Cubebs, and their pungent spicy taste. If rectified with water, it leaves a soft and resinous mass. It cannot be distilled by itself without undergoing decomposition. It is composed of $C_{15}H_{12}$. By standing for some time it deposits a Stearoptene, which has been called Camphor of Cubebs by Mr. Winkle.

Action. Uses. Appears to possess all the virtues of Cubebs in doses of ♏x.—fʒß. It may be given with Sugar in Water.

Tinctura Cubebæ, L. D. Tincture of Cubebs.

Prep. L. Macerate for 7 days *powdered Cubebs* ℔j. in *Proof Spirit* Oij. Strain. D. ℥v. in Oij. *Rect. Sp.*

Action. Uses. Stimulant. Used in Gonorrhœa, in doses of fʒj. two or three times a day.

Matico, D. Artanthe elongata, *Miquel.* The leaves.

Matico is a name applied in South America and Mexico apparently to the leaves of several very different plants. Martius, in the *Phar. Central Blatt.*, considered it to belong to the genus Phlomis. Mr. Hartweg informs Dr. Lindley that "Matico is the vernacular name applied by the inhabitants of Quito to *Eupatorium glutinosum*, or the Chussalonga." He adds, "That it is the true Matico of the inhabitants of Quito and Riobamba, I have not the smallest doubt. I have also a small quantity of powdered leaves of some shrub possessing the same virtue as the Matico, collected in Bolivia, where it is known under the name of Moxo-Moxo. From bits of square stems which I find in the parcel, I suspect this to belong to some Labiatæ." (Lindley, Veg. Kingd. p. 707.) But it is equally certain that what has been of late years imported here, and of which specimens were distributed by Dr. Jeffreys of Liverpool, are the leaves, with portions of the stem and flowering-spikes, of a species of a genus allied to Piper, first called *Piper angustifolia*, but now named *Artanthe elongata.* (*v.* P. J. iii. 472 and 525, and Lindl. *l. c.* p. 517.)

The Matico was first brought into notice by Dr. Jeffreys as a Styptic (*Lancet*, Jan. 7, 1839) in leech-bites and wounds of arteries, and has been found efficacious in many obstinate cases of bleeding, as from the nostrils, and even from the tongue. Its *under* surface, which is reticulated with veins, and covered with hairs, should be applied, as it

is probably on this structure that its utility chiefly depends. Applied to wounds, it acts as a soft plug, and its action is probably simply mechanical. Analyzed by Dr. Hodges, it was found to contain a peculiar bitter principle, *Maticina*, with Volatile Oil. But though its infusion strikes a green colour with a solution of Sesquichlor. Iron (as Peppermint will do), it contains no appreciable quantity of either Tannic or Gallic acid. It is probably useless as an internal Styptic, as which, nevertheless, it has been recommended by some. It has no real astringency.

INFUSUM MATICO, D. Infusion of Matico.

Prep. Infuse *Matico leaves* cut small ʒß. in *boiling water* Oß. for 1 hour in a covered vessel. Strain.

TINCTURA MATICO, D. Tincture of Matico.

Prep. Macerate *Matico leaves* in coarse powder ʒviij., in *Proof Spirit* Oij. for 14 days. Strain.

These are intended for internal administration. Probably useless.

URTICEÆ, *Juss.* Nettleworts.

The Urticeæ contain a great many plants very unlike each other, except in the structure of their inconspicuous flowers and small fruit. They are, however, divided into several tribes, which are now as often considered distinct families. They are widely diffused in tropical and temperate climates; the shrubby and arboreous species in the former, the herbaceous ones in the latter. Many secrete an acrid principle. Of the true Urticeæ none are officinal.

Tribe *Cannabineæ*. Annual or perennial, with watery juice. Flowers diœcious; male paniculate. Perianth calyx-like, 5-parted, imbricate in æstivation. Stamens 5, inserted into the bottom of the perianth. Female flowers in a spike or catkin with bracts. Perianth urceolate or spathe-like. Ovary free, 1-celled, 2 styled, with a single pendulous ovule. Nut bivalved, 1-seeded. Seed pendulous. Embryo without albumen, hooked or spiral, with the radicle superior. The genera Humulus and Cannabis are officinal; each contains only a single species.

LUPULUS, L. E. D. Humulus Lupulus, *Linn.* Amentum; the Catkin, L. E. The dried Strobiles, D. *Lupuline*, the dried powder separated from these by rubbing and sifting, D. The Common Hop. *Diœcia Pentandria*, Linn.

The Hop plant was known to the Romans, being considered to be the *Lupus salictarius* of Pliny. It is found wild in many parts of Europe, and was seen by Bieberstein among the bushes and hedges of the Caucasus. It is found in China, said to be wild in North America, and to be a native of this country. Humalineæ, or Hop-grounds, are mentioned in the ninth century in Germany. In the thirteenth century, Hops were introduced into the breweries of the Netherlands. Its culture is supposed to have been introduced into this country from Flanders in the reign of Henry VIII. Both Hops as well as Newcastle Coals were petitioned against by the city of London, the former

"in regard they would spoyl the taste of drink and endanger the people;" whence Henry VIII. issued an injunction "not to put any hops or brimstone into the ale." As in the history of many other prejudices, we observe at length a complete reversal of opinion, Hops being now considered indispensable in the brewing of all malt liquors.

Fig. 90.

The Hop (fig. 90) is a perennial rooted plant, with annual pliable stems, which on poles or in hedges climb to a great extent, twining from right to left, slender, somewhat angular, rough, with little asperities and minute reflexed hairs. The leaves are opposite, the upper alternate, on long, often winding petioles, the smaller heart-shaped, the larger 3 to 5-lobed, serrated, veiny, and

extremely rough, with prickle-like pubescence. Stipules 2, bifid, between the petioles, reflexed. Flowering branches axillary. Flowers numerous, of a yellowish-green colour. *Males* (*a*) on a separate plant (a few on the female), in axillary panicles. Perianth 5-parted; segments oblong, spreading. Stamens 5; filaments short; anthers with a projecting apex, oblong, 2-celled, opening by longitudinal lateral slits. Pollen globose. *Females* (*b*), like the males, on a separate plant, in dense catkins or strobiles, with membranous concave bracts (*d*), each supporting a flower. In place of perianth there is a membranous scale or sepal, which embraces the ovary and grows with it (*c*). Ovary ovate, subcompressed, 1-celled, with a single ovule. Stigmas 2, elongated. Fruit a strobile or catkin, formed by the enlarged bracts and scales or sepals, which are glandular and embrace the nuts. These are small, subglobular, erect, 1-seeded. Pericarp hard, but fragile, covered with yellow, cellular, superficial, aromatic glands (*lupuline*) (*f*). Seed pendulous. Testa membranous. Embryo (*e*) without albumen, spiral, with long cotyledons. Radicle roundish, turned towards the hilum.—Nees von E. 101. St. and Ch. 41. Fig. 90, where a bit of the male plant is shown on the right, and the female on the left and above the male.

Hop plants grown from root-sets come to perfection in the third year from planting. They spring out of the ground about the end of April, and come into flower about the end of August. The catkins are fit to gather from the beginning of September to the middle of October, the time varying according to the sort cultivated, but chiefly by reason of differences in the seasons. They are then picked, dried by artificial heat in kilns, and packed in large long bags, the finer in pockets. Hops consist of the leaf-like bract and of the scale-like sepal which invests the seed-nut. This, or rather the scale and the base of the bract, is covered with numerous superficial glands, which have been called *Lupulinic glands*, and simply *Lupuline*, though this name is objectionable, as also indicating the peculiar or Bitter principle. Dr. Ives of New York, by thrashing, rubbing, and sifting, procured from 6 lb. of Hops about 6 oz. of these *grains;* but there is always intermixed some fragments of the bracts and scales. The *glands* are yellow, shining, roundish, or kidney-shaped, cellular, somewhat transparent, and sessile; the point of attachment is called the hilum (*v.* a magnified view in fig. *f* from Raspail). The catkins are officinal; and the Lupuline also in the D. P. Hops are remarkable for their bitter taste combined with a very agreeable odour, especially when being picked or collected in kilns or breweries. The bitterness resides partly in the bracts, but also in the glands, to which the aromatic qualities are especially due. The medicinal properties also depending on them, the E. and D. C. direct that these glands or grains are to be used in making the Tincture of Hops. Analysed by MM. Payen, Chevalier, and Pelletier, these *Hop* glands were found to consist of Volatile Oil 2 parts, Bitter Extract (which has been called *Lupuline* and *Lupulite*) 10 parts, Resin 50 to 55, with Gum, Extractive, Ozmazome, Fatty matter, Malic acid, Malate of Lime, and other salts. The bracts, analysed by the same chemists, yielded only a trace of the Volatile Oil, Bitter Extract, and Resin, but some Tannin and Colouring matter, Chlorophylle, Gum, Lignin, with some free acid and different salts. A portion of

the active properties both of Hops and of the Hop glands are taken up by water, but they are completely extracted by Spirit. An infusion of Hops displays the reactions of Tannic acid.

Two varieties of the Hop plant are particularly distinguished: one cultivated near Canterbury and in East Kent, of which both plants and catkins are smaller; the latter being ovoid, about an inch and a half in length, of a pale but lively yellowish-green colour, and of a fine aromatic fragrance. The West Kent or Sussex Hop grows to a much larger size, is considered hardier, and its catkins are about two and a half, sometimes four inches in length, but do not bring so high a price in the market as the East Kent hops. As root-sets from the female plants are alone planted by cultivators, the author was led to inquire how the seeds were perfected—and, if they were so, whether the Hop glands were produced in as great abundance and perfection as they might be if some *male* were set along with the *female* plants. He was informed by Mr. Alderman Masters of Canterbury that some male blossoms are always produced on the female plants, and suffice for the purpose of fertilizing them. Specimens possessing this monœcious character have been since sent by Mr. Masters to Dr. Lindley. The author has been unable to learn whether the female ever changes into a male plant, or *vice versâ*, as has been observed with the Nutmeg plant. He may mention, that, owing to the kindness of the above gentleman, as well as of Joseph Royle, Esq., of Stuppington, where the finest Hops are grown, he has been enabled to introduce the Hop plant into the Himalayas, where it is now flourishing alongside of the China Tea plant. The root-sets, with the ends dipped in wax, wrapped in cotton, and enveloped in caoutchouc-cloth, were sent by the overland mail to the East India Company's Botanic Garden at Saharunpore. They arrived there in a living state, as reported by Dr. Jameson, and have produced fine plants; as have also the seeds sent with them. The successful cultivation of Hops would bring malt liquors more within the reach of European soldiers, and assist in detaching them from the pernicious spirituous compounds of the bazaars, which now destroy the health and shorten the lives of thousands. Well *hopped* ale, moreover, is well known to be one of the best Stomachics and Tonics for convalescents from many Indian diseases.

Action. Uses. Stomachic and Tonic, slightly Narcotic. The property of Hops of giving the bitter to Beer, and, by preventing acetous fermentation, of enabling it to be kept much longer, is well known. To it no doubt is owing a portion of the stomachic properties of malt liquors, as we see exemplified in the bitter, often called Indian, ales. Hops are Hypnotic, especially when stuffed into a pillow, but they should be first moistened with Spirits, to prevent the rustling noise. Fomentations of Hops have been used. The Lupulinic or Hop glands may be given in doses of from gr. vj.—gr. xij. made up into pills.

Infusum Lupuli, L. Infusion of Hops.

Prep. Macerate for 4 hours in a lightly covered vessel *Hops* ʒvj. in boiling *Aq. dest.* Oj. Strain.

Action. Uses. Tonic, slightly Narcotic, in doses of f℥iß.

Tinctura Lupuli, L. E. Tinct. Lupulinæ, D. Tincture of Hops.

Prep. L. Macerate *Hops* ℥vj. in *Proof Spirit* Oij. for 7 days. Press and strain.

Tincture of Hop Glands, E. From freshly dried *Hops* q. s. separate by friction and sifting the yellowish-brown powder attached to their scales, and of this take ℥v., *Rectified Spirit* Oij. Prepare by percolation, as Tinct. Capsicum.

D. *Lupuline* ℥v., *Rect. Sp.* Oij.

Action. Uses. The Tincture of the glands is superior in efficacy to the other. The E. Kent Hops contain a larger proportion of glands than the Sussex Hops. Rectified Spirit is also the best solvent of the Hop glands. Doses of fʒß.—fʒij.

Extractum Lupuli, L. E. Extract of Hops.

Prep. Prepare from *Hops* as Extr. Liquorice, L., as Extr. Logwood, E.

Action. Uses. Tonic; being bitter, without aroma: in doses of gr. v.—℈j.

Cannabis sativa and its variety *C. indica.* The Leaves and Resin of Hemp. The Extract, D.

The Hemp appears to be a plant of the Persian region, where it is subjected to great cold in winter, and to considerable heat in summer. It has thus been able to travel on the one hand into Europe, and on the other into India; so that the varieties produced by climate have by some been thought to be distinct species, the European being called *C. sativa*, and the Indian *C. indica.* The name *κάνναβις*, by which it was known to the Greeks, seems to be derived from the Arabic *kinnub*, the *canape* of the middle ages, Dutch *kinnup* and *hinnup*, German *hanf*, whence the English *hemp.* Herodotus mentions it as Scythian. Bieberstein met with it in Tauria and the Caucasian region. It is well known in Bokhara, Persia, and abundant in the Himalayas. It seems to have been employed as an intoxicating substance in Asia and Egypt from very early times, and even in medicine in Europe in former times, as we find it noticed in Dale (*Pharmacologia*, i. 133) and Murray (*Apparat. Medicaminum*, iv. p. 608—620), where it is arranged, as in this work, next to the Humulus. It has of late years been brought into European notice by Dr. O'Shaughnessy.

The Hemp is a diœcious (occasionally monœcious) annual, from 3 to 10 feet high, according to soil and climate. Root white, fusiform, furnished with fibres. The stem erect; when crowded, simple; but when growing apart, branched even from the bottom, angular, and, like the whole plant, covered with fine but rough pubescence. The leaves are opposite or alternate, on long petioles, scabrous, digitate, composed of from 5 to 7 narrow, lanceolate, sharply

serrated leaflets, of which the lower are the smallest, all tapering at the apex into a long entire point. Stipules subulate. *Males* on a separate plant. Flowers in drooping, axillary, or racemose panicles, with subulate bracts. Perianth 5-parted; segments not quite equal, downy. Stamens 5; filaments short; anthers large, pendulous, 2-celled; cells united by their backs, opening by a longitudinal slit. *Females* in a crowded spike-like raceme, with leafy bracts. The perianth consists of a single, small, spathe-like sepal, which is persistent, acuminate, ventricose at the base, embraces the ovary, and is covered with short brownish glands. Ovary subglobular, 1-celled, with one pendulous ovule. Style short. Stigmas 2, elongated, glandular. Nut ovate, greyish-coloured, smooth, covered by the calycine sepal, bivalved but not dehiscing, and inclosing a single oily seed. Seed pendulous. Testa thin, membranous, marked at the apex with a coloured hilum. Embryo without albumen, doubled upon itself. Radicle elongated, turned towards the hilum, and the apex of the nut separated from the incumbent plano-convex cotyledons (by a small quantity of albumen, *Lindley*).

The Indian plant has by some been thought to be a species distinct from the European one; but, like Dr. Roxburgh and others, the author was unable when in India to observe any difference between the plant of the plains and that of the hills of India, nor between these and the European plant. The Indian secretes a much larger proportion of resin than is observable in the European plant; but a difference is observed in this point in India between plants grown in the plains and in the mountains, and also between those grown more or less thickly together. The natives plant them wide apart, to enable them to secrete their full powers. In Europe, the thick sowing, and moister, often dull climate, will prevent the due secretion of the peculiar principles of a plant of the Persian region. But the plants grown in a sunny season, from the great heat and light, ought to be more resinous than usual. It is not without interest to observe that both the Hop and Hemp, belonging to the group *Cannabineæ*, owe their properties to glandular resinous secretions. The author, in calling attention to the uses of this plant, in his *Illustr. of Himalayan Botany*, stated that "the leaves are sometimes smoked in India, and occasionally added to Tobacco, but are chiefly employed for making *bhang* and *subzee*, of which the intoxicating powers are so well known. But a peculiar substance is yielded by the plants on the hills, in the form of a glandular secretion, which is collected by the natives pressing the upper part of the young plant between the palms of their hands, and then scraping off the secretion which adheres. This is well known in India by the name of *cherrus*, and is considered more intoxicating than any other preparation of the plant; it is so highly esteemed by many Asiatics as to serve them both for wine and opium: it has in consequence a variety of names applied to it in Arabic, some of which were translated to me, as "grass of faqueers," "leaf of delusion," "increaser of pleasure," "exciter of desire," "cementer of friendship," &c.*

* In an old Chinese book preserved in the Bibliothéque Nationale at Paris, it is stated that a preparation of *Chanvre*, or *Mayo*, was used in China in the third century of our æra as an anæsthetic. The Hemp-plant is esteemed for

Linnæus was well acquainted with its "vis narcotica, phantastica, dementens" (anodyna et repellens). It is as likely as any other to have been the *Nepenthes* of Homer." (*l. c.* p. 334.)

Dr. O'Shaughnessy has described in detail the different preparations, as—

1. *Churrus*, the concreted resinous exudation from the leaves, slender stems, and flowers. This is collected in various ways; that of the Himalayas is much esteemed, that of Herat and of Yarkund still more so. For a specimen of the last the author is indebted to Dr. Falconer.
2. *Ganjah*. Dr. O'S. describes it to be the dried hemp plant which has flowered, and from which the resin has not been removed. The bundles are about two feet long, and contain twenty-four plants. In N. W. India the name *Ganjah* is applied to the whole growing plant.
3. *Bang*, *Subjee*, or *Sidhee*, is formed of the larger leaves and capsules without the stalks.

The leaves of common Hemp have been analysed, but the analysis requires to be repeated and carefully compared with that of the Indian plant. The properties seem to depend upon the Resin. This is very soluble in Alcohol and Ether, as well as in the fixed and volatile Oils, partially soluble in alkaline, insoluble in acid solutions; when pure, of a blackish-grey colour. (The Yarkund specimen is of a dark blackish-green, another kind is of a dirty olive.) Its odour is fragrant and narcotic; taste slightly warm, bitterish, and acrid. The *Ganjah*, which is sold for smoking chiefly, yields to Alcohol 20 per cent. of resinous extract, composed of *churrus* and Chlorophylle. The Messrs. Smith of Edinburgh state that the whole activity of Indian Hemp resides in a peculiar resin, for which Rectified Spirit is the best solvent. It is precipitated by the addition of water to its alcoholic solution,—and Proof Spirit will not extract it at all.

Action. Uses. All these preparations are capable of producing intoxication, whether the *churrus* be taken in the form of a pill, or with conserve, or the dried leaf be rubbed up in milk and water with a little sugar and spice, or smoked. As a medicine, it was tried by Dr. O'S. in Rheumatism, Hydrophobia, Cholera, and Tetanus. In the last such marked benefit and cures were produced, that the Hemp was pronounced an Anticonvulsive remedy of the greatest value. Its general effects are, alleviation of pain (generally), remarkable increase of

its intoxicating properties in many parts of the world. Dr. Daniell states that it is smoked in large quantities by the natives of Congo, Angola, and South Africa, being called by them *Dakka* and *Damba*. The same kind of pleasurable excitement is produced by other substances, as by Coffee and Opium; to which may be added the leaves of *Catha edulis* and *C. spinosa*, which are masticated and drunk in infusion by the Arabs at Aden, under the name of Kat.

appetite, unequivocal Aphrodisia, and great mental cheerfulness. Its more violent effects were, delirium of a peculiar kind, and a cataleptic state. Dr. Pereira was among the first to submit it to experiment, but failed in obtaining any results, probably from changes having taken place in the drug. Dr. Laurie pronounced it uncertain, and not to be trusted to as a narcotic. Mr. Ley, however, found it useful in relaxing spasm, and producing sleep, and during its action observed an abatement of pain. Mr. Donovan found its power great in temporarily destroying sensation, and subduing the most intense neuralgic pain. Professor Miller of Edinburgh considers its virtue to consist in a power of controlling inordinate muscular spasm. Dr. Clendinning says that in his hands its exhibition has been followed by manifest effects as a soporific or hypnotic in conciliating sleep, as an anodyne in lulling irritation, as an antispasmodic in checking cough and cramp, and as a nervous stimulant in removing languor and anxiety. The Hemp may be used in the following preparations and doses; but Dr. O'S., when in England, found that he was obliged to give as much as 10 or 12 grs. and even more; though in India he considered gr. ½ a sufficient, and 1½ gr. of the Extract a large dose. The Extract made in India, and then imported, has been found to be much stronger than that made over here,—which seems to show that the plant undergoes some injury during the voyage. (Squire.)

Extractum Cannabis Indicæ Purificatum, D. Purified Extract of Ind. Hemp.

Prep. Dissolve *Ext. of Ind. Hemp* of commerce (*Churrus*) ℥j. in *Rect. Spirit* f℥iv., and when the dregs have subsided decant the clear liquid, and evaporate with a water-bath to a soft extract.

D. Gr. ß.—1.; sometimes much more.

Tinctura Cannabis Indicæ, D. Tincture of Indian Hemp.

Prep. Dissolve the *Purified Extract* ℥ß. in *Rect. Spirit* f℥x. 22 minims contain 1 grain of the Extract.

D. ♏x.—f℈j. A drachm or so may be given in Tetanus or Hydrophobia every half-hour, until the paroxysms cease, or Catalepsy is induced. Proof Spirit has often been used, which accounts for some of the failures which have been made with this medicine. Its Resin is insoluble in Proof Spirit. (*v.* p. 628.)

Mr. Donovan states the only preparation to be relied upon is the Tincture of the Resin prepared from properly collected Hemp.

Tribe *Artocarpeæ*. Shrubs or trees, with white or yellowish milky juice. Leaves alternate, large, convolute. Flowers unisexual, in a consolidated, fleshy receptacle or head, seldom spiked. Ovary 1 or 2-celled, with 1 to 2 styles. Ovule 1, erect, straight. Fruits berried, 1-seeded, often growing together, or in a fleshy receptacle. Embryo without albumen. Radicle superior.—Tropical family, with a few species in higher latitudes. Among them are many secreting acrid principles; some very poisonous, as the *Antiaris toxicaria*, or Upas-tree of Java; but there are also some which yield edible fruits.

Mori Succus, L. Morus nigra, *Linn.* Fructûs Succus; the Juice of the Fruit. The Common Mulberry. *Monœcia Tetrandria*, Linn.

The Mulberry is the Μορέα ἢ Συκαμινέα of Dioscorides and of other Greeks, and is mentioned in Luke xvii. 6, as *συκάμινος*. It has no doubt been known from the earliest times.

Tree of 25 to 30 feet in height. It is often described as watery in juice; but Mr. Sievier at the author's request examined and found it to contain Caoutchouc. (*Antiq. of Hind. Med.* p. 10.) Leaves alternate, roundish, often lobed, cordate, rather acuminate, coarsely serrated, pubescent. Stipules oblong, deciduous. Flowers monœcious, thickly set, or distinct. Unisexual catkins. Perianth 4-lobed; in each the lobes concave. *Male* flowers in a spike. Stamens 4, alternate with the segments of the perianth. *Female* flowers clustered in ovoid catkins. Sepals 4, scale-like, overlapping each other, becoming fleshy. Stigmas 2, linear, glandular. Fruit formed by the accretion of the sepals of the perianth become fleshy, each inclosing a lenticular nucule. Seed pendulous. Embryo curved, in fleshy albumen.—Native of Persia, early introduced into the south of Europe.—Nees von E. 100. St. and Ch. 39.

Mulberries, formed by the lateral aggregation of the several female flowers, constitute an ovoid spurious berry; they are at first reddish, but become of a deep purple colour when ripe, and contain an agreeable subacid juice. They are refrigerant and slightly laxative.

Syrupus Mori, L. Mulberry Syrup.

Prep. With the aid of gentle heat dissolve *Sugar* ℔ijß. in strained juice of *Mulberries* Oj.; set by for 24 hours; then remove the scum, and from the dregs, if there be any, remove the clear liquid. To this add *Rectified Spirit* f℥iiß.

Action. Uses. Refrigerant. Used also for colouring draughts.

Ficus, L. E. D. Ficus Carica, *Linn.* Fructus preparatus, L. The dried Fruit, E. D. The Common Fig. *Diœcia Triandria*, Linn.

The Fig (*σῦκον*) has been employed in diet and in medicine from very early times.

A small tree. Leaves cordate, often palmately lobed, scabrous above, pubescent beneath. Flowers monœcious, numerous, stalked, and inclosed within a pear-shaped fleshy receptacle, which converges so as to leave only a small orifice at the apex, forming what is commonly called the fruit or Fig, with a few bracteal scales at its base. *Male.* Perianth 3-lobed. Stamens 3. *Female.* Perianth 5-parted. Ovary semi-adnate. Style single. Stigmas 2. Utricle single, covered with the persistent, somewhat fleshy, perianth, and sunk into the fleshy receptacle. Achœnium lenticular, hard. Embryo curved, within fleshy albumen.—Native of Asia, long introduced into Europe, Nees von E. 97. St. and Ch. 154.

Formerly, as in the present day, the process of caprification was practised, to assist the ripening of the fruit. This consists in puncturing the fruit with a sharp instrument covered with oil.

The trunk and branches of the common and other Fig trees abound in a milky, usually acrid juice. This is found also in unripe Figs; but as they ripen, mucilaginous and saccharine matter is produced. The fig

becomes soft, juicy, and of a delicate flavour, in favourable climates. When nearly ripe, they are dried in large quantities in the south of Europe, and are exported to this country. They form also an article of commerce in Asia, being imported into India from Affghanistan and Persia.

Action. Uses. Figs are dietetical, slightly laxative with those unaccustomed to their use. Chiefly employed as Demulcent; or, heated and split open, applied as Cataplasms; or used as additions to such preparations as Decoct. Hordei Comp. and Confectio Sennæ.

CONTRAJERVA. Root of Dorstenia Contrajerva, *Linn.*, and probably of other species.

This root is supposed to have been first made known by Monardes; others say that it was first sent by Sir F. Drake to Lecluse, who named it *Drakena radix.* The name signifies *counter-poison.*

There is reason to believe, from the statement of Martius and of others, that several species, as *D. braziliensis, Houstoni, Drakena,* all yield it. Dr. Pereira states that none of the roots of *D. Contrajerva* are met with in commerce.

The Contrajerva root of commerce is imported from Brazil, and probably yielded chiefly by *D. braziliensis*, especially as it resembles it in character. The part which is used is the root, or rootstock, which is præmorse, an inch or two in length, scaly or wrinkled, of a greyish colour externally, paler within, with numerous slender radicles from its sides, as well as one or two long tapering ones from its base. The odour is somewhat aromatic; the taste slightly bitterish, warm, and aromatic. The radicles have less of these sensible properties, which are readily extracted by Spirit, and partially by boiling water. They depend chiefly on a Volatile Oil, Resin, Bitter Extractive, and Starch.

Action. Uses. Stimulant, Tonic, and Diaphoretic; but little used in the present day, though formerly employed (in the form of *Pulv. Contrajervæ Comp.*) in low states of Fever and malignant Exanthemata. It is not now officinal.

D. Of the powder ℈j.—℈ij.; or it may be given in infusion.

Tr. *Ulmeæ.* Ovary 2-celled. Seed pendulous. Embryo straight.

ULMUS, L. Ulmus campestris, *Linn.* Cortex interior. The Elm.

The Elm is supposed to be the πτερέα of Dioscorides.

A tree of 60—80 feet, with rugged bark. Leaves rhomboid-ovate, acuminate, wedge-shaped, and oblique at the base, always scabrous above, downy beneath, doubly and irregularly serrated, sometimes incurved. Branches wiry, slightly corky, when young, light brown, and pubescent. Flowers perfect. Perianth bell-shaped, 5-cleft, persistent. Stamens 5. Styles 2. Capsule compressed, oblong, with a broad membranous wing all round, deeply cloven, naked. (*Lindl.*) European forests, &c.—Nees von E. t. 104.

The inner bark, which is officinal, should be stripped from the tree in spring, and its epidermis and outer layer of bark afterwards removed. The pieces are broad, thin, tough; taste mucilaginous and slightly bitter. It contains *Tannin*, about 3 per cent.; and a peculiar mucilaginous or gummy principle, called *Ulmine.*

Action. Uses. Demulcent, Tonic; thought also to be Alterative in Cutaneous affections. Used in decoction in doses of ℥iij.

DECOCTUM ULMI, L. Decoction of Elm Bark.

Prep. Take bruised *Elm Bark* ℥ijß., *Aq. dest.* Oij. Boil down to Oj. Strain.

AMENTACEÆ, *Juss.*

The Amentaceæ are found chiefly in temperate climates, with the exception of Salix, which is more widely diffused. They yield valuable timber, and some hardly less valuable bark, which, on account of its astringency, is used as a medicine, for tanning, and as a dye. The acorns of some of them are employed as articles of diet.

Tribe SALICINEÆ. Flowers all in catkins. Fruit naked, 2-valved, 1-celled, many-seeded. Seeds erect, comose.

SALIX, *Linn.* Willow. *Diœcia Diandria*, Linn.

The bark of different species of Willow (ἰτέα) has been long employed medicinally, and its use has been revived in modern times. The species are numerous, and all difficult to distinguish from each other. But the best practical rule is, " Select those whose barks possess great bitterness combined with astringency." (*Pereira.*)

Three British species,—*Salix fragilis*, the Crack Willow, *S. alba*, the White Willow, and *S. caprœa*, the Sallow, were specified in the last edition of the D. P., but they are not at present officinal.

Willow bark will of course vary somewhat according to the species from which it is obtained; but it is thin, flexible, rolling up into a quill, or like shavings, with a brown epidermis, white in the inside; reduced with difficulty to powder, having a slight odour, but a powerfully bitter and astringent taste. Besides the usual constituents of vegetables, it contains *Tannin*, which gives it astringency. Buchner discovered in it the peculiar neutral principle called *Salicine.* From the presence of Tannin, the bark is sometimes used in tanning, and a greenish colour is produced by sesqui-salts of Iron. Water and Alcohol take up its active properties.

Salicine is very bitter, crystallizes in white silky needles or laminæ, and has no alkaline reaction. It differs also from the vegetable alkalies in not containing Nitrogen, and not forming salts with acids. It is soluble in 5·6 parts of cold, and in much less of boiling water; soluble in Alcohol, but insoluble in Ether. Sulphuric acid decomposes it, producing a bright red colour. Heated with Sulph. Acid and Bi-

chromate of Potash, it forms Hydruret of Salicyle, and gives off the odour of Oil of Meadow-sweet. This substance (Sl H) strikes a violet colour with the solution of a persalt of Iron. It may be thus detected in the urine of persons who have taken Salicine. Salicine, according to Piria, has the composition $C_{26}H_{18}O_{14}$. It is found in several species of *Salix* and of *Populus;* of the former, in *S. Helix*, *alba*, &c. It may be obtained by acting on a saturated decoction of the bark with Acetate or Oxide of Lead, getting rid of the Lead by means of Sul′ or a current of Sulphuretted Hydrogen gas, then evaporating the solution until the Salicine crystallizes, and purifying it with animal charcoal and recrystallization.

Action. Uses. Astringent Tonic. Useful as a Stomachic, and even for arresting Agues. It may be given in Infusion (dried bark ℥j.—Aqua Oj.), or in Decoction, in Doses of f℥jß every two or three hours.

Salicine may be used as a febrifuge in doses of 2—8 or even 20 grs., like the Sulphate of Quinine. It has been employed to adulterate the latter.—*q. v.*

Tribe Cupuliferæ. Male flowers in a catkin. Female solitary, or aggregated, or spiked. Perianth adnate to the ovary, with a denticulated limb, sometimes evanescent, surrounded by a coriaceous involucre.

Quercus, *Linn.* Oak. *Monœcia Polyandria*, Linn.

Monœcious. Male catkins long, pendulous, lax (Fig. 91, *a*). Stamens 5 to 10 (*b*). Perianth (*b*) 5 to 7-cleft. Female flower solitary, with a cup-shaped scaly involucre (*c*, magnified). Stigmas 3 (*c*), Ovary 3-celled, 2 of which are abortive. Nut or acorn 1-celled, 1-seeded, surrounded at the base by the enlarged cup-shaped involucre. (*d*, the young fruit; *e*, the same magnified and cut vertically, that the perianth, ovary, and ovules may be seen. *f*, a cotyledon with the radicle.)

Quercus, L. E. D. Quercus pedunculata, *Willd.* Cortex; the Bark. The Common Oak.

Species of the Oak (δρῦς of the Greeks, and *allon* of the Bible) have been esteemed for their strength and astringency from the earliest times.

The common English Oak, which by some botanists is named *Q. Robur*, Linn., and by others *Q. pedunculata*, Willd. (Fig. 91), has its acorns borne on long peduncles, and is thus distinguished from *Q. sessiliflora*, Salisb. (*Q. Robur*, Willd.), which has its acorns clustered upon a very short stalk, or sessile, with leaves on elongated stalks. E. B. t. 1845. Nees von E. t. 92. Dr. Lindley states that the timber of this kind is very superior to that of the former; but opinions differ respecting the timber of these species: for medical purposes one is probably as good as the other. Dr. Greville states that the characters of the different kinds pass insensibly and completely into each other.

QUERCUS PEDUNCULATA, Willd. *Quercus Robur*, Linn. Young branches glabrous. Leaves on short footstalks, cuneately oblong, pinnatifid, slightly pubescent beneath. Leaves oblong, rounded, with deep, narrow, somewhat acute sinuses; bases biarticulate, equal. Female catkins on long footstalks. Acorns oblong. —Woods.—E. B. t. 1842. Nees von E. t. 93.

The Oak is stripped of its bark in spring and in the beginning of summer. It is usually in long strips, of a coarse fibrous texture, and not easily reduced to powder. When deprived of its epidermis, it is of a light brown colour externally. The odour is faint, but the taste bitter and roughly astringent. Its properties are readily extracted by water and by Proof Spirit. Its constituents are Tannin (about 15 per cent.), Gallic acid, Uncrystallizable Sugar, Pectin, Tannates of Lime, of Magnesia, and of Potash, &c. The inner part of the bark contains the largest portion of Tannin, and most in the spring of the year. On account of the presence of this principle, a precipitate takes place with Gelatine, and a blackish-coloured one on the addition of a sesquisalt of Iron.

Fig. 91.

Action. Uses. Astringent, in Gargles, Lotions, and Baths for children; sometimes in doses of ʒß.—ʒij. of the powder given as a

Febrifuge. Applied externally, made into a poultice, in flabby ulcers and external Gangrene.

DECOCTUM QUERCUS, L. E. D. Decoction of Oak Bark.

Prep. L. Take bruised *Oak Bark* ℥x., *Aq. dest.* Oij. Boil down to Oj. Strain, E. Similar. D. Stronger.

Action. Uses. Astringent; internally in chronic Diarrhœa; as a Gargle in relaxed Uvula; or as an Injection in Leucorrhœa. It has been recommended for injection into the cyst of Hydrocele.

GALLA, L. E. D. Quercus Infectoria. Tumor ramuli a Cynipe Gallæ tinctoriæ excitatus, L. Excrescences formed by the *Cynips* (or *Diplolepis*) *Gallæ tinctorum*, E. D. Galls. *Nutgalls.* The Gall Oak.

Galls were known to Hippocrates, and are described by Dioscorides (i. c. 147) under the name κηκις, which the Indo-Persian writers have converted into *fikees.* They are the *afus* of the Arabs, and well known in India by the name of *majoo-phul.* Galls are imported into England from Smyrna, being produced in Asia Minor; also from Aleppo, the produce of the vicinity of Mosul in Kurdistan. They are also imported into England from Bombay (sometimes to the extent of 1000 cwt.), having been first brought there from the Persian Gulf. Mr. Wilkinson, of the house of Wilkinson and Jewsbury, informs me that formerly, when he paid much attention to this trade, he observed that whenever the prices were low at Smyrna, the Galls came from Bombay, and *vice versâ;* but the supply was never abundant from both sources in the same year. They are imported into Bombay from Basra (Bussorah), which is not a great deal farther from Mosul than is Aleppo. These are therefore most probably the produce, like Aleppo Galls, of Kurdistan and of other Persian provinces. Dr. Falconer, when travelling in the Punjab, was informed that Galls were produced on the Balloot Oak, *Quercus Ballota.*

Galls are produced on different species of Oak, as well as on some other plants, as the Tamarisk. Aleppo Galls are formed by the female of the above *Cynips* (or Diplolepis) piercing the buds of *Q. infectoria,* with its ovipositor, and there depositing its eggs. These, producing irritation, cause the juices of the plant to flow towards the wound, and the subsequent enlargement of the part into the form of a gall round the larva. This, when fully developed, escapes by a hole which it perforates in the gall.

Quercus infectoria, now generally acknowledged to be the species yielding the Galls of commerce, is a small tree or shrub, with a crooked stem, not above 6 to 8 feet high. Leaves on short stalks, 1—1½ inch long, ovate-oblong, with a few coarse mucronated teeth on each side; apex bluntly mucronate, rounded. and rather unequal at the base, smooth, shining on the upper side. Acorn solitary, obtuse, 2 or 3 times longer than its hemispherical scaly cup.—A native of Asia Minor; found by Capt. Kinnier in Armenia and Kurdistan.—Nees von E. t. 94. St. and Ch. 152.

Besides the names applied from the places whence they are obtained, the officinal or Levant Galls are distinguished by their physical characters, as into Blue and White Galls. The *Blue Galls* vary in size, and are of a bluish-grey colour. They are gathered before the insect has become perfect, or worked its way out. Some of these are larger, and are called Green Galls from being of a greenish colour. They display on their otherwise smooth surface a number of bluntly-pointed tubercles, which would appear to be the apices of leaves stimulated into unnatural growth. The best are heavy, hard, shining, and break with a short flinty fracture. *White Galls* are so called from being of a lighter colour than the others, but still of a greyish or yellowish hue. They are distinguished by being perforated with a small round hole, that by which the insect had escaped. They are usually less heavy than the others, have a larger internal cavity, and are not so astringent. A third variety, called *Large Mecca Galls*, are sometimes imported from Bussorah. They are also called Dead Sea Apples, and *Mala insana*. They are identical with some specimens brought by the Hon. R. Curzon from the Holy Land in 1847. They are spherical in shape, and surrounded about the centre by a circle of horned protuberances. They are astringent like other galls, and when fresh are said to be purple and shining. They are thought to be the produce of a peculiar variety of *Q. infectoria* which grows on the mountains near the Dead Sea. (P. J. viii. 422.)*

Nutgalls are easily reduced to powder, which is without odour, but with a simple and powerful astringent taste. They yield their properties to water, which is the best solvent: also to Proof Spirit, and slightly to Alcohol and Ether. From 500 parts Sir H. Davy obtained 185 parts of matter soluble in water, of which he states 130 were Tannin, 31 Gallic acid with a little Extractive, 12 of Mucilage, &c., and 12 of saline and calcareous salts, the insoluble matter consisting chiefly of Lignin. But a larger proportion of Tannin has been obtained by other chemists, as from 30 or 40 to 60, instead of the above 26 per cent. The little colouring matter in Galls makes them particularly valuable to tanners.

DECOCTUM GALLÆ, L. Decoction of Galls.

Prep. Boil *bruised Galls* ℥ijß. in *Aq. Dest.* Oij., down to Oj., and strain.

Used internally in doses of f℥j.—f℥ij.

TINCTURA GALLÆ, L. E. D. Tincture of Galls.

Prep. L. D. Macerate for seven days powdered *Galls* ℥v. in *Proof Spirit* Oij. Strain.
E. Or prepare by percolation, as Tinct. Capsicum.

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* Peculiar Galls of an irregular shape have now and then been imported from China, where they are known by the name of *Woo-pei-tzee*. They are very astringent, and are supposed by Dr. Schenk to be formed by the puncture of the leaves of the *Rhus semialata*, Murray, (Terebinthaceæ,) by a peculiar species of *Aphis*.

Action. Uses. Astringent in doses of fʒß.—fʒij. May be diluted with water as a Lotion, or for exhibition in cases of poisoning with vegeto-alkalis.

UNGUENTUM GALLÆ, D. Ointment of Galls.

Prep. Rub finely-powdered *Galls* ʒj. with *Ointment of White Wax* ʒvij. to a uniform mixture.

Astringent to external Hæmorrhoids.

UNGUENTUM GALLÆ COMPOSITUM, L. Ung. Gallæ et Opii, E. Compound Ointment of Galls.

Prep. L. Triturate into a uniform mass very finely powdered *Galls* ʒvj., *Opium* powdered ʒjß., *Hog's Lard* ℥vj.,
E. *Galls* ʒij., *Opium* ʒj., *Axunge* ℥j.

Action. Uses. Astringent and Anodyne application to Hæmorrhoids. The E. preparation is much stronger than that of the L. P., as it contains more Opium and less Lard. Dr. Paris suggests dissolving Morphia in Olive Oil, and adding the Ointment of Galls.

ACIDUM TANNICUM, L. D. Tannic Acid. A crystalline acid prepared from the Oak-Gall.

Tannic Acid, or Tannin, exists in Galls in large quantity, being generally obtained from them, though a constituent of many other astringents, as Oak bark, Catechu, &c.

Prep. D. Incorporate *Sulphuric Ether* Oiij. with *Dist. Water* f℥v. by agitation, and pour the resulting solution in successive portions upon *Galls* (coarsely powdered) ℥viij., previously introduced into a glass or porcelain percolator. The liquid which accumulates in the bottle below will consist of two distinct strata. (The Tannic and Gallic acids are both extracted by this mixture of ether and water. The Tannic acid is the most soluble in water, and forms with it a heavy solution, which separates from the ether. The latter floats above, holding in solution Gallic acid.) The heavier liquid is to be separated, and evaporated to dryness, finally applying an oven heat, which is not to exceed 212°. From the lighter liquid the ether may be recovered by distilling it by means of a water bath, and with the aid of a Liebig's condenser.

It is the type of Astringents. Ordinary Tannin is amorphous, brownish-coloured, and consists of impurities united to the Tannic acid. Tannin or Tannic acid is, when pure, white, but usually has a yellow tinge, is spongy, shining, without odour, but extremely astringent. It is very soluble in water and in weak Spirit. When heated, it swells up, and is decomposed, leaving a bulky charcoal. It precipitates Gelatine from its solutions; and combines with the Gelatinous parts of skin, and thus forms leather. It forms precipitates (Tannates), most of which are nearly insoluble, with most metallic oxides, and likewise with alkalis and their Carbonates, including vegetable alkalis. The mineral acids, combining with the Tannic, also form precipitates in concentrated solutions. With sesqui-salts of Iron it is well known to form a black precipitate (ink); the Tannin

of Sumach, Catechu, &c., as has been frequently mentioned, forms a very dark green precipitate with the same salts; no effect is produced on the Proto-salts of Iron. Tannic acid is composed of $C_{18}H_5O_9+3HO$.

ACIDUM GALLICUM, L. D. Gallic acid. A crystalline acid prepared from the Oak-gall.

Prep. D. Place *Galls* in coarse powder ℔j. in a porcelain dish. Pour on them as much water as will convert them into a thick paste, and keep them in this moistened condition for six weeks, at a temperature of 60°—70°, adding water from time to time, to supply the loss by evaporation. Boil the residue for 20 minutes with *water* f℥xlv., and then place over a calico filter. The filtered solution, on cooling, will afford a copious precipitate. Drain this on a calico filter; subject it, enveloped in blotting-paper, to strong expression; and again dissolve in *Boiling Water* f℥x. When the solution has cooled down to 80°, pour it off from the crystals which have formed, and having washed these with f℥iij. of ice-cold water, dry them, first on blotting-paper, and finally by a steam or water heat. More crystals may be obtained by again boiling the galls in water, adding this to the mother-liquor of the first crop, and evaporating. They may be freed from colour by animal charcoal.

By the exposure to the air the tannin is gradually oxidized, and gallic acid formed. This is extracted by the boiling water, and deposited by it on cooling, being comparatively insoluble. Any Tannic acid is left in the mother-liquor.

The equivalent of Gallic acid is $C_7H_3O_5$. It is colourless and crystalline, with an acid and styptic taste. It is soluble in water, alcohol, and ether. It causes a dark colour with a solution of a persalt of Iron. But it differs from Tannic acid in being unable to precipitate gelatine, or albumen, or the vegetable alkaloids. It is therefore of no use in tanning. Externally applied, it is not nearly so astringent as Tannic acid, but internally it is equally efficacious, and may be given in a smaller dose. It is thought probable that it combines with something in the system which enables it to act *internally* in the same manner as Tannic acid *externally*. (Headland.) Gallic acid is usually met with as a yellowish crystalline powder.

Though Galls are stated by Sir H. Davy to contain only about 6 per cent. of this acid, a much larger quantity may be obtained from them, because it is formed by the conversion of the Tannic′ into Gallic acid by the absorbing of oxygen from the atmosphere, Carbonic′ being given off.

Action. Uses. Galls are powerfully Astringent; though seldom given internally. The author frequently prescribed from 10 to 20 grs. of the powder several times a day, or in Infusion, in the obstinate chronic Diarrhœas of the natives of India. The natives themselves prescribe them in Intermittents. Its Tincture is much used as a test for the salts of Iron. An Infusion may be employed as a Gargle, Wash, or Injection, or as an antidote to poisoning by vegete-alkalis, but the diluted Tincture affords a more ready antidote.

Tannic and Gallic acids are the best astringents with which we are acquainted. For external application, as a styptic, &c., the former is the best. For internal use, as in Hæmaturia, Hæmoptysis, Profuse sweating, &c., Gallic acid is preferable. It is given in doses of gr. iij.—x. three times a day.

BALSAMACEÆ, *Lindl.*, contains the genus *Liquidambar*, of which one species, *L. styraciflua*, is indigenous in North America. This yields in Mexico and Louisiana a liquid balsam of an aromatic odour and taste, containing Styracine and Benzoic acid. Dr. Pocock found *L. orientale* in Cyprus, where it was called *Xylon Effendi*, the tree of our Lord. It produces an excellent turpentine. It has been thought that this yields some of the liquid Storax of commerce; as some liquid Balsam, under the name of *Rose Maloes*, and *Rosa Mallas*, makes its appearance in the accounts of the commerce of the Red Sea and Persian Gulf; and Petiver, as quotod by Dr. Lindley, states that the tree which yields it is the *Rosa Mallas*, and grows in Cobross, an island at the upper end of the Red Sea, near Cadess, which is three days' journey from Suez. It is sent in barrels by way of Jidda to Mocha. This is supposed by some to be yielded by *Liquidambar Altingia* of Blume, a native of Java, which is there called *Ras-sa-mala*, and undoubtedly yields the fine liquid Storax or *Rosamala* of the Malayan Archipelago. (*Lindley.*) But Dr. Pereira has ascertained that all the liquid Storax imported for the last seven years comes from Trieste. He also states that the strained Storax (*Styrax colatus*) sold to the perfumers is prepared from this variety of liquid Storax.

GYMNOSPERMÆ, *Lindl.* Gymnosperms.

This division has been made of some Exogens, in consequence of their ligneous tissue being dotted with disk-like marks, and their ovules being truly naked, so as to be fertilized directly through the foramen of the ovule.

The CYCADEÆ form a small family somewhat resembling Palm trees in appearance, and were at one time thought to be allied to them and to Ferns. By Mr. Brown they have been shown to be most closely allied to Coniferæ.

A kind of Sago is said to be procured from the cellular substance occupying the interior of the stem of *Cycas revoluta*, a native of Japan, and also of *C. circinalis.* Both exude a clear insipid mucilage, which hardens into a firm transparent gum, like Tragacanth, but clearer. Dr. Roxburgh was unable to ascertain that any of the species yielded Sago, or a substitute for it, though species of Cycas are quoted as yielding Sago in the E. P., and *C. circinalis* is quoted by the D. P.

Dr. Lindley states that one of the best kinds of Arrow-root is pre-

pared in the Bahamas from the trunk of some species of Zamia which is a native of the West India Islands.

Coniferæ, *Juss.* Conifers.

Yield valuable timber, as Deal, Cedar, &c., and most of the species exude Turpentine, which is a compound of resin and volatile oil.

The products of Coniferous plants officinal in the Pharmacopœias are so numerous, are obtained from so great a variety of sources, and are yet so similar to each other, that it is hardly possible to refer them all with correctness to their respective plants. It is preferable, therefore, as has been done by Dr. Pereira and in Duncan's *Edinburgh Dispensatory*, first to enumerate the several Pine-trees which are supposed to yield these products, and then to treat of the products themselves,—of natural Turpentine, of Resins of different kinds, and then of those obtained with the aid of heat, as Oil of Turpentine, Tar, and Pitch.

Pinus, *Linn.* Pine. *Monœcia Monadelphia*, Linn.

Flowers monœcious. *Males.* Catkins racemose. Filaments short. Anthers crested, 2-celled, bursting longitudinally (or Stamens 2, Anthers 1-celled).) *Females.* Catkins solitary, or from 2 to 3. Scales imbricated, with membranous bractlets. Ovules 2, at the base of the scales, collateral, inverted, their points lacerated and directed downwards. Scales of the cone hard, woody, and truncated, hollowed at the base for the reception of the seeds. Seeds prolonged at the base into a membranous wing. Leaves evergreen, usually acicular, in fascicles, surrounded at the base by a membranous tubular sheath.

Pinus sylvestris, *Linn.* L. D. Scotch Fir. Red Deal. Leaves in pairs. Young cones stalked, recurved, ovate-conical. Wing thrice as long as the seed.—Lamb. Pin. t. 1. Nees von E. t. 79.—Scotland, Norway, woods of Europe, north of the Alps.—This species yields much Turpentine, Pitch, and Tar, though at present little of it is imported into this country.

P. maritima, *Dec.* (P. Pinaster of Lambert), Nees von E. t. 76, 77, is abundant on the southern coasts of Europe, as well as of England, and in the south of France in the department of the Landes. It yields Bourdeaux Turpentine, Galipot, Pitch, and Tar.

P. palustris, *Lambert.* The Swamp Pine and Long-leaved Pine. A large tree, distributed from the southern States of Virginia to the Gulf of Mexico. "This tree furnishes by far the greater proportion of Turpentine, Tar, &c., consumed in the United States, or sent from them to other countries." *Wood and Bache.*

P. pinea, *Lamb.* and *P. Cembra*, the Siberian Stone Pine, are interesting. as the seeds of both, sometimes called *Pine-nuts*, are eaten, as are those of *P. Geradiana*, in Affghanistan and Tibet. *P. longifolia*, Lamb., is a Himalayan species; which yields a very fine Turpentine, resembling pure white granular honey; much used by the natives of India in medicine, and called *bireeja*, &c.

Abies, *Tourn.* Fir.

Monœcious. *Males.* Catkins solitary. Anthers bursting transversely. *Fe-*

males. Catkins simple. Scales (or carpels) imbricated, thin at the apex, rounded, flat, instead of being hollowed for the seeds; when ripe, falling from the axis. Leaves solitary in each sheath, never fascicled. In other respects agreeing with Pinus.

ABIES EXCELSA, *Dec.* (*Pinus Abies*, Linn.) Norway Spruce Fir. — Leaves scattered, tetragonal. Cones cylindrical, pendulous; the scales rhomboidal, flattened, jagged, and bent backwards at the margin. — Northern parts of eastern Europe, Alps, northern parts of Asia and America.—Nees von E. t. 80. Yields Abietis Resina by spontaneous exudation.

A. Picea, Lindl. The Silver Fir, with distichous leaves and erect cones. A native of the mountains of central Europe. Yields Strasburgh Turpentine.

A. BALSAMEA, *Marsh.* (*Pinus balsamea*, Linn.) Canadian Balsam and Balm of Gilead Fir. Leaves solitary, flat, subpectinate, suberect above. Acuminate apex of the scales of the cone when in flower reflexed. — Northern parts of North America.—Lamb. Pin. t. 41. Nees von E. t. 82.

A. canadensis, Lindl. Hemlock Spruce Fir is said to exude a Turpentine similar to that of the foregoing. *A. nigra*, the Black Spruce Fir, is interesting as yielding the Essence of Spruce.

LARIX, *Tourn.* Larch.

Monœcious. Catkins and cones lateral. *Males.* Catkins simple, ovate. Anthers numerous, with their filaments united into a thick column. Anthers crested, bursting longitudinally. Leaves, when first expanding, in tufted fascicles, becoming somewhat solitary by the elongation of the new branch.

LARIX EUROPÆA, *Dec.* (*Abies Larix*, Lam. *Pinus Larix*, Linn.) The Larch is a lofty tree, with wide-spreading branches; when well grown, the extremities droop gracefully. The Leaves deciduous. Flowers reddish. Cones ovate-oblong. Edges of scales reflexed, lacerated. Bracts panduriform. *Lambert.*—Nees von E. 83. St. and Ch. 75.—A native of the Alps, much cultivated in this country. Yields Venice Turpentine, and a kind of Manna called "Manna de Briançon."

Larix (or Cedrus) *Deodara* (Deodar and Kelon), the Himalayan Cedar, is an elegant and lofty tree, hardy as the Larch, and yielding valuable timber. It has been extensively introduced into this country by the East India Company, and is interesting as having been long employed in medicine by the Hindoos, and known even to Avicenna. (*Hindoo Med.* 36.) Its Turpentine, known by the name *kelon-ke-tel*, is in great repute in the North-west of India, from its stimulant properties and power of healing deep-seated ulcers, as in elephants and camels.

I. Turpentines: natural Oleo-resins of Coniferæ.

TEREBINTHINA, L. E. D. Pinus palustris, and Pinus Tæda, L. Pinus sylvestris, *Linn.*, D. Various species of Pinus and of Abies, E. Oleo-resina e trunco, abstracto cortice, fusa, L. Fluid Resin, E. Common Turpentine.

Turpentine exudes naturally or from incisions from most trees of the Pine tribe, as also from *Pistacia Terebinthus* (p. 380). It consists of Resin intimately mixed with a Volatile Oil, known in its separated or distilled state as Oil of Turpentine. In time, all Turpentines become converted into Resins, from the evaporation of the Oil, and by its oxidation. They all soften by heat, burn readily, are

soluble in Alcohol and Ether, unite with the fixed Oils, and resemble each other very closely in taste and smell; but differ in being more or less white or dark-coloured, and in the odour and taste being more or less agreeable. Water acquires only a little of their properties, but they may be made into an emulsion with eggs or vegetable Mucilage.

Common Turpentine used to be procured from *Pinus sylvestris*, as it still is in many parts of Europe, and also from *P. maritima*, which yields the Bourdeaux Turpentine, and in winter the *galipot* of the French. But Dr. Pereira has shown that almost the whole quantity of Turpentine imported here is from America. This is procured chiefly from *P. palustris*, partly also from the *P. Tæda*, as stated by the L. C. It is generally obtained by removing a portion of the bark, hollowing out a cavity below it into the wood, and allowing the Turpentine to exude into this. This Turpentine is viscid, semifluid, of a dull light yellowish colour, with a warm, acrid, rather bitter taste, and a moderate terebinthinate odour. When fresh, it yields 17 per cent. of Oil of Turpentine. (*W.* and *B.*) The Bourdeaux Turpentine is whitish, turbid, separates upon standing into a transparent liquid and into a granular honey-like semifluid. It is acrid and nauseous in taste, of a disagreeable smell, and yields about 20 per cent. of Oil. M. Faure discovered that it might be solidified by the aid of a 32nd part of Magnesia. Common Turpentine yields Oil of Turpentine and Resin, q. v., and is a constituent of Ung. Elemi. (p. 391) and of Emp. Galbani (p. 472).

Terebinthina Veneta, E. Fluid Resinous exudation of *Larix europæa.* Venice Turpentine. This, when genuine, is a thick tenacious fluid, usually of a cloudy appearance, of a yellowish-green tint, acrid and bitter in taste, and of a strong peculiar odour. It is obtained from Italy, Switzerland, and the Alps. It is sold in Paris as Strasburgh Turpentine, and is distinguished by being less liable than others to solidify. (*Guibourt and Pereira.*) Dr. Thomson stated long since that the Venice Turpentine of the shops was imported from America. This is probably a factitious preparation. What is usually sold for Venice Turpentine is a mixture of Oil of Turpentine with common Resin. Venice Turpentine is intended to be a constituent of Emp. Cantharidis, E., and of Ung. Infusi Cantharidis, E.

Balsamum Canadense, E. Fluid Resin of *Abies balsamea.* Canada Balsam is procured by breaking the vesicles which naturally form upon the trunks and branches, and then collecting their fluid contents. It is often called Balm of Gilead. When fresh it is nearly colourless, of a light yellow colour, transparent like thin honey; solidifies slowly; is of a strong, rather agreeable odour, and a bitterish, rather acrid taste. It is also obtained by making incisions into the tree. Strasburgh Turpentine is sometimes substituted for it.

ABIETIS RESINA. THUS, L. E. D. Resin of Abies excelsa and Pinus palustris, L.

The Resin of the Norway Spruce Fir may be arranged with the Turpentines as being a spontaneous exudation, and with the Resins as having lost by evaporation most of its Volatile Oil. It is called *Thus*, or Frankincense. It is chiefly obtained from Canada. It is collected in the form of concrete tears, which are hard and brittle, but soften readily at the temperature of the body. It is of a light yellowish or brownish-yellow colour externally, lighter within; slight terebinthinate odour, and acrid bitter taste. The substance which the French call *galipot* or *barras* is the concretion produced on the Pine of the Landes, late in the year or in winter, when the collection of Bourdeaux Turpentine has ceased. Some *Thus* consists of the solidified *Terebinthina* of P. Palustris, (p. 641). A very fine Resin is spontaneously yielded by the Himalayan *Pinus Morinda,* Royle.

Thus præparatum, L., is made by boiling commercial Frankincense in water until it melts, and then straining it through a hair sieve, to free it from mechanical impurities.

This Resin is employed in making Pix Burgundica, Emp. Opii, L., Emp. Thuris, D., Emp. Galbani, L. D., Emp. Ferri, and Emp. Picis, L.

PIX BURGUNDICA, L. E. D. Burgundy Pitch is the above Resin (of *Abies excelsa*) melted in water immediately after being scraped from the tree, and strained through a cloth. It is thus freed from mechanical impurities, with a loss of a little of its Volatile Oil. It closely corresponds with *Thus præparatum.* But most of that which is sold is a factitious compound of Resin rendered opaque by the incorporation of water, and coloured by Palm Oil, or made from concrete American Turpentine. (*Pereira.*)

Pix Burgundica præparata, L., is prepared like Ammoniacum præp., being strained through a hair sieve. Were *Pix Burgundica* merely strained *Thus*, this preparation would be quite superfluous; but it seems to have been introduced on the idea that the former, which is sometimes obtained from France, differs essentially from the American product of the same tree. This is probably not the case with the purer kinds.

Burgundy Pitch is used to make the following Plaster, also, Emp. Cantharidis Co. E., and Emp. Cumini, L.

EMPLASTRUM PICIS, L. E. Burgundy Pitch Plaster. Warm Plaster.

Prep. L. Take *Prepared Burgundy Pitch* ℔ij., *Prepared Frankincense* ℔j. *Resin* and *Bees' Wax* āā ℥iv.; melt them together; then add *Expressed Oil of Nutmegs* ℥j., *Olive Oil* f℥ij., *Aq.* f℥ij.; then, constantly stirring, evaporate to a proper consistence.

E. Similar; no Frankincense. The Oil of Nutmeg is called *Oil of Mace.*

Action. Uses. Warm Rubefacient Plaster to the chest and joints, &c.

II. Resin and Oil prepared from Turpentine.

RESINA, L. E. D. Quod restat Terebinthinæ postquam Oleum destillatum est, L. Residue of the distillation of the Volatile Oil from Turpentines of various species of *Pinus* and of *Abies*, E.

When any of the Pinic Turpentines are subjected to distillation with or without water, the Volatile Oil, rising as soon as they are much heated, leaves behind a solid Resin, which is often called Colophony (Fr. *Colophane*), from the Greek κολοφονία, but usually Black Resin, though it is only of a brownish-yellow colour, transparent, and a little empyreumatic. When the distillation is not carried quite so far, or if more water is added during the process, and agitated with it while in fusion, some of it becomes incorporated with the Resin, which is rendered opaque, or of a whitish colour. This is the *Resina* of the Pharmacopœia, or *Yellow*, sometimes called *White Resin*. The incorporated water escapes by evaporation, or may be expelled: the Resin then becomes of a pale yellow colour and transparent.

Resin is solid and transparent, very brittle, with a glassy fracture; is a little heavier than water; differs in colour according to its purity; has a weak terebinthinate odour and taste; melts at a moderate heat, becomes decomposed at a higher, producing both an oil and a gas; and burns with a smoky flame. It unites when in fusion with Wax, fats, and fatty oils, also Spermaceti; is readily dissolved by Alcohol, Ether, and many volatile oils; and is insoluble in water. The strong acids decompose it: the alkalies unite with it, and form soaps. Instead of being simple, it is chiefly a compound of two acid bodies, one called *Sylvic*, the other *Pinic acid*. Besides these, it contains a third acid, *Colophonic*, formed by the action of heat upon *Sylvic*, and a trace of a neutral resinous substance. The *Sylvic* is more soluble in cold and diluted Alcohol, and may thus be separated from the two others. It crystallizes in small, quadrangular, rhombic prisms, is colourless, insoluble in water, soluble in Ether, in strong hot Alcohol, and in volatile oils. *Pinic acid* ($C_{20}\,H_{15}\,O_2$) is isomeric with Sylvic, and has many of the same properties. *Colophonic acid* is of a brown colour, and sparingly soluble in Alcohol.

Action. Uses. Mild Stimulant; used externally, but chiefly on account of its adhesive properties, in various Cerates, Unguents, and Emplastra. For Emp. Resinæ, *v.* p. 176.

CERATUM RESINÆ, L. Ung. Resinosum, E. Ung. Resinæ, D. Resin Cerate, or Basilicon Ointment.

Prep. L. With a gentle heat melt together *Resin* ℥xv., and *Wax* ℥xv.; then add *Olive Oil* Oj. and press the Cerate, while hot, through linen.

E. *Resin* ℥v., *Axunge* ℥viij., *Wax* ℥ij.

D. *Resin* ℔ß., *Lard* ℔j., *Yellow Wax* ℥iv.

Action. Uses. A mild Stimulant, applied to foul or indolent ulcers.

TEREBINTHINÆ OLEUM, L. E. D. Oleum e Terebinthinâ destillatum, purificatum, L. Volatile Oil of the Turpentine of various species of *Pinus* and of *Abies*, E. Oil of Turpentine.

Oil of Turpentine, separated from the Resin by the process of distillation, is found swimming on the surface of the water with which it is distilled, and is not observed to differ materially when obtained from different Pine trees. The author, when in India, distilled the Oil from the Turpentine of *Pinus longifolia*, which, when sent to the General Hospital at Calcutta, was pronounced to be "of very superior quality." Dr. Pereira states that American Turpentine is now chiefly employed for obtaining the Oil, which it produces at the rate of about 14 to 16 per cent., and that the Bourdeaux Turpentine yields an inferior Oil and Resin.

Ol. Terebinthinæ is prepared by distilling Turpentine with water in a copper alembic. Yellow Resin remains behind. The L. C. orders the rectified Oil to be employed. It is obtained by redistilling the commercial Oil, as in the following formula of the E. C. for *Purified Oil of Turpentine.*

Prep. Cautiously distil *Oil of Turpentine* Oj. with *Aq.* Oiv. as long as oil comes over with the water. Mr. Flocton redistils from a solution of caustic Potash, to get rid of all traces of resinous and acid matters. (*Per.*)

This purified Oil is limpid, colourless, with a powerful penetrating odour, and pungent bitterish taste. Sp. Gr. 0·865; boils at about 312°, but, as volatilization proceeds, at 350°. Sp. Gr. of its vapour 4·764. It is very inflammable, producing much black smoke. It is slightly soluble in water, more readily in Ether and in Alcohol; miscible in all proportions in the fixed oils; dissolves resins and fats, and is one of the few solvents of Caoutchouc. When moist and exposed to great cold, it deposits crystals, which are a Hydrate of the Oil. Sul′ chars it, Nit′ and Chlorine set it on fire. It absorbs H Cl acid gas, and a substance called *artificial Camphor* ($C_{20} H_{16} H Cl$) is produced. The composition of Oil of Turpentine is $C_{20} H_{16}$. When exposed to the air, it absorbs Oxygen, by which Resin is produced: therefore Oil which has been long kept usually contains some. Oil of Turpentine is supposed to consist of two very similar and isomeric oils, one of which forms a solid Camphor with H Cl, the other a liquid Camphor. These two oils have been named *Camphene* and *Terebene.*

Action. Uses. Rubefacient and Counter-Irritant when applied externally. Stimulant when taken internally, acting as a Diuretic and Diaphoretic; in large doses, as a Cathartic; useful as an Anthelmintic. For this purpose, and to act as a Cathartic, it is sometimes conjoined (f℥ij) with a little Castor Oil (f℥vj). Its action is, however, somewhat uncertain. It sometimes produces dangerous congestion of the kidneys, evidenced by strangury or total suppression

of urine. Occasionally, intoxicating effects are produced by large doses. In doses of ♏viij—f℥ß. frequently repeated, it acts as a Stimulant, becomes absorbed, and is exhaled both by the skin and lungs, while the urine acquires a violet odour. In large doses (f℥iv.—f℥ij.) it acts as a Cathartic, and its irritant effects, as those of Strangury, are not perceived, from absorption not having taken place. It should be made into an emulsion with the yolk of one egg for every f℥ij., and diluted to the patient's taste, with water, plain or aromatized. (*c.*)

CONFECTIO TEREBINTHINÆ, D. Turpentine Confection.

Prep. Rub *Oil of Turpentine* f℥j., with powdered *Liquorice root* ʒj., then add *Clarified Honey* f℥ij., and beat them to a uniform consistence.

D. ʒß.—ʒiv.; used as an anthelmintic.

LINIMENTUM TEREBINTHINÆ, L. E. D. Turpentine Liniment.

Prep. L. Shake together till mixed *Oil of Turpentine* f℥xvj., *Camphor* ℥j., *Soft Soap* ℥ij.
E. *Resin Ointment* ℥iv., *Camph.* ℥ß., and *Oil of Turp.* f℥v., mixed.
D. *Resin Ointment* ℥viij., and *Oil of Turpentine* f℥v.

Action. Uses. Stimulant Liniment, but chiefly used by applying lint soaked in it to burns and scalds. (*Dr. Kentish.*)

ENEMA TEREBINTHINÆ, L. E. D. Turpentine Enema.

Prep. L. Mix together *Oil of Turpentine* f℥j. with *Yolk of one Egg,* and gradually add *Barley Water* f℥xix.
E. Made with *Yolk of Egg* and *Water.*
D. f℥j. to *Mucilage of Barley* f℥xvj.

Action. Uses. Antispasmodic; Anthelmintic in cases of Ascarides.

III. Empyreumatic products of Coniferous trees.

PIX LIQUIDA, L. E. D. Pinus sylvestris, *Linn.*, et aliæ species, L. Bitumen liquidum e ligno igne comparatum, L. Tar, from various species of Pinus and Abies, E.

Tar has been employed in medicine from very early times. It is imported into this country both from the north of Europe and from North America. It is prepared by submitting the roots and branches of different Pine trees to a smothered combustion. The resinous matter is melted and altered by the heat, and the Tar flows out as a viscid and tenacious fluid, of a brownish-black colour, having a bitter, resinous, and slightly acid taste, and an empyreumatic odour. It is a very complex mixture of Resin and Oil of Turpentine, both modified (forming *Pyretine* and *Pyroleine*), some Charcoal, and Pyroligneous acid, with various products of the destructive distillation of the wood. By subjecting it to distillation, Oil of Tar and Pyro-

ligneous acid are obtained, and Tar-water is made by agitating it with water. Tar is soluble in Ether, Alcohol, and the fixed and volatile oils. Several kinds of it yield *Creosote*, *Paraffine*, *Eupion*, &c., when the liquid parts are evaporated; and Pitch is left.

Action. Uses. Tar, taken internally, is an Alterative Stimulant, and especially recommended in Lepra; applied externally it promotes a healthy action in indolent ulcers, and in some cutaneous diseases. The vapour is sometimes inhaled in chronic bronchial affections.

D. ʒj.—℥ß., daily.

Tar-water, holding Creosote and other matters in solution, was considered by Bishop Berkeley to be a panacea for most diseases, but is now never used.

UNGUENTUM PICIS LIQUIDÆ, L. E. D. Tar Ointment.

Prep. L. Melt together *Tar*, and *Suet*, āā ℔j. Express through linen.
E. *Tar* ℥v., *Wax* ℥ij.
D. *Tar* ℔ß., *Wax* ℥iv.

Action. Uses. Stimulant. Useful in Ringworm, Lepra, and some Ulcers.

PIX, L. (*Pix nigra.*) Bitumen aridum e Pice liquidâ comparatum. Pitch.

Pitch is left after the distillation of the liquid parts of the Tar. It is well known for its black colour and firm texture, and consists of many of the same constituents as Tar.

Action. Uses. Stimulant and Alterative. Used in Ichthyosis, &c., in doses of gr. x.—ʒj. in pills.

UNGUENTUM PICIS, L. Pitch or Black Basilicon Ointment.

Prep. Melt together *Black Pitch, Wax, Resin,* āā ℥xj., *Olive Oil* Oj. Express through linen.

Action. Uses. Stimulant application to Porrigo, Leprous eruptions, and indolent ulcers.

Tribe *Cupressineæ.*

Flowers diœcious, rarely monœcious, upon different branches. *Males.* Catkins axillary or subterminal, ovate, small. Anthers 4—7, 1-celled, inserted on the lower edge of the subpeltate scales. *Females.* Flowers few, in an axillary ovate catkin, imbricated, with bracts at the base, lower ones barren. Scales 3—6, united at the base, and containing usually 3 ovules, which are erect, perforated at the apex. Fruit a galbulus, consisting of the scales become succulent, and consolidated into a drupe-like body. Seeds osseous, triquetrous.

JUNIPERUS, *Linn.* *Diœcia Monadelphia*, Linn.

JUNIPERUS, L. E. D. Juniperus communis, *Linn.* Fructus, L. Tops and Berries, E. D.

The Juniper (ἄρκευθος) was employed by the Greeks, and subsequently by the Arabs, being their *abhool.* Species are mentioned in the Bible. (*v.* Bibl. Cycl.)

The Juniper forms a bushy shrub. Branches smooth and angular towards their extremities. Leaves evergreen, 3 in each whorl, crowned, linear, subulate, channelled, stiff and sharp-pointed, longer than the galbulus, of a shining green colour on their lower surface, but having a broad glaucous line along the centre of the upper, which is resupinate. Flowers axillary, sessile, the males discharging much yellow pollen. Females on a separate shrub, green, on scaly stalks. The fruit ripens in the autumn of the second year.—A native of the northern parts of Europe, Asia, and America.—Nees von E. 86. St. and Ch. 141.

All parts of this plant when bruised exhale a more or less agreeable terebinthinate odour. The wood is officinal on the Continent, but the tops and fruits in this country. The latter are imported from the north, but the best come from the south of Europe. They are globular, marked with three radiating furrows at the summit and below by the bracts; are of a purple-black colour with a glaucous bloom, and contain a brownish-yellow pulp. Their taste is sweetish, followed by bitterness, slightly terebinthinate, as is the odour, and somewhat aromatic. These properties are imparted partly to water and readily to Alcohol, depending on the presence of Volatile Oil (q. v.) 1 per cent., Wax 4, Resin 10, Gum 7, Grape Sugar with Salts of Lime, 33·8, the remainder being Lignin and water=100.

Action. Uses. Berries Stimulant, Diuretic; but seldom used. Largely employed in the manufacture of Hollands Gin.

OLEUM JUNIPERI, L. E. D. (*Anglicum,* L.) Oil of Juniper.

Oil is obtained from the fruits (and other parts of the plant) by distillation with water. It is colourless, or of a light green tinge, lighter than water, corresponding very closely with the Oil of Turpentine, like it little soluble in Alcohol. Like it also, it is supposed to consist of two isomeric oils, the formula of each being $C_{20}H_{16}$. It has the odour of the fruit, and a warm aromatic taste.

Action. Uses. Stimulant, Diuretic. Considered very certain in its effects in doses of ♏iv.—♏vj. Its effects may be assisted by combination with Spirit of Nitre and with Digitalis. Hollands Gin owes its Diuretic properties to the presence of this Oil.

INFUSUM JUNIPERI, D. Infusion of Juniper.

Prep. Infuse for 1 hour in a covered vessel *bruised Juniper berries* ℥j. in *boiling water* Oß., and strain.

Action. Uses. Diuretic. *D.* f℥j.—f℥iij.

SPIRITUS JUNIPERI COMPOSITUS, L. E. D. Comp. Spirit of Juniper.

Prep. L. Dissolve *Oil of Juniper* f℥jß., *Oil of Carraway* and *Oil of Fennel,* āā ♏xij. in *Proof Spirit* Cj.
E. D. Similar; but prepared by distillation from the fruits.

Action. Uses. Stimulant adjunct in doses of f ʒij.—f ʒiv. to Diuretic draughts. May be substituted for Hollands in prescriptions.

SABINA, L. E. D. Juniperus Sabina, *Linn.* Cacumen recens et exsiccatum, L. The Tops, E. D. Savin.

Savin is the *βραθυς* of Dioscorides, converted by the Arabs into *buratee.*

A small, bushy, very compact shrub, disposed to spread. Branches slender, completely invested by the short imbricating leaves. Leaves small, ovate, convex, opposite, decussate, deeply imbricated. Fruit round, of a bluish purple, about the size of a currant.—A native of the midland parts of Europe, of the mountains of the south of Europe, and of Russia in Asia.—Nees von E. 87.

The whole plant exhales a strong fœtid odour, and has an acrid, bitter, and disagreeable taste. The officinal parts are the young branches, which are completely enveloped in the small imbricated leaves, and, when dry, retain a portion only of the properties of the fresh plant. These are taken up by Spirit, fixed oils, and fats, partially by water. They depend on the presence of a Volatile Oil, Resin, Gallic acid, &c. A deep green colour is formed on the addition of a Sesqui-salt of Iron to its watery infusion.

Action. Uses. Irritant, in large doses poisonous. Sometimes used to destroy warts, and its ointment to keep open issues. In small doses, Stimulant, Diuretic, and Emmenagogue. Often taken to cause abortion: it can only do so by producing inflammation, and thus may destroy the mother, sometimes without causing the expulsion of the child. Dr. Pereira recommends it as an Emmenagogue, in the form of an infusion in 64 parts of water, in doses of f ʒiv.—f ℥j., or the Volatile Oil in some mucilaginous vehicle.

OLEUM SABINÆ, L. E. D. Savin Oil.

Obtained, in the proportion of about 3 per cent., by distilling with water the fresh tops of the plant; is light in colour; in composition resembles Oils of Juniper and of Turpentine; has the strong odour and the disagreeable acrid taste of the plant.

Action. Uses. Acrid Stimulant. Emmenagogue in doses of ♏ij.—♏v. with Sugar, gr. x.—℈j. or with some mucilaginous substance.

UNGUENTUM SABINÆ, L. E. D. Savine Cerate or Ointment.

Prep. L. Melt *Lard* ℔j. with *White Wax* ℥iij., and mix in with them *Fresh Savine, bruised,* ℔ß. Press through a linen cloth. E. Similar.
D. *Finely powdered Savine* ʒj., mixed with *Ointment of White Wax* ʒvij.

Action. Uses. Acrid application to keep open blistered surfaces, and the discharge from setons. But much of the oil is dissipated. When made in a porcelain vessel on a water-bath, it is of a yellowish green colour, efficient, and active, and will keep good for a long time. It ought not to be made in a copper vessel. (P. J.)

CLASS II. MONOCOTYLEDONES *vel* ENDOGENÆ.

PALMÆ, *Juss.* Palms.

Palms by Linnæus were styled the Princes of the vegetable kingdom. It has been said that Flour, Sugar, Oil, Wax, and Wine are all yielded by the family of Palms, as well as thread, utensils, timber for habitations, and leaves for thatching.—They inhabit chiefly the tropical parts of the world, though a few extend to higher latitudes.

Phœnix dactylifera is the Date tree, affording Dates as the chief article of diet to thousands of Arabs and Africans, and which are imported here as an article for the dessert.

Phœnix sylvestris in India, with *Arenga saccharifera* and *Nissa fruticans* in Indo-China, yield large quantities of Sugar by the simple evaporation of their sap.

Cocos nucifera, the Cocoa-Nut Palm, one of the most useful of trees, is valuable on account of the kernel of its fruit, (mentioned by Avicenna as the Indian Nut,) which is not only edible, but yields large quantities of Oil.

Elæis guineensis and *E. melanococca* yield the immense quantities of Palm Oil which are imported from the west coast of Africa. The Oil is obtained by bruising the fleshy part of the fruit. It has a solid consistence, is of an orange-yellow colour, and rather a grateful odour. It consists of about 30 parts of a peculiar solid fat, *Palmitine*, and 70 of *Elaine*, besides the principles which give it odour and colour. It is emollient, and sometimes used as an embrocation to spasms and bruises; but its chief employment is for making soap. The E. C. in their last Pharmacopœia erroneously indicated the *Cocos butyracea*, a South American Palm, as the source of Palm Oil.

ARECA CATECHU, *Linn.*, E. The Catechu or Betle Nut Palm, *foful* of the Arabs, receives its specific name from a kind of Catechu being made from its seeds, which, being boiled down, yield an astringent Extract, from the large quantity of Tannin which they contain. On this account the tree is mentioned in the E. P. as one of the sources of Catechu; but it does not seem probable that any of this Catechu reaches Europe (*v.* p. 396), for Catechu is one of the regular imports into the ports of the Madras Presidency. The seeds or nuts are, however, always in demand, and are an extensive article of commerce, because they form one of the ingredients of the celebrated masticatory of the East, called Pan or Betle. (*v.* p. 617.) They are sometimes sold cut into transverse slices.

Calamus Draco, Willd., is one of the species which yields the reddish resinous substance known as Dragon's-blood (the *dum-al-akhwain* of the Arabs). It is only used for colouring.

Ceroxylon (now *Iriartea*) *andicola* yields wax, as does another Palm, called *Carnauba* in Brazil.

SAGO, L. E. D.

Sagus lævis, Rumph., is mentioned in the L. P. as yielding Sago, which is described as *Caudicis fæcula*. Other species of Palms are also alluded to. In the E. and D. P. it is said to be the Farina from the interior of the trunk of various Palms and species of Cycas.

The Malays are said to prefer the Sago of *S. Rumphii*. Dr. Roxburgh states that the granulated Sago is made from *Sagus* (*inermis*, Roxb.) *lævis*, Jack. Blume states it to be produced by *Sagus lævis* and *S. genuina.* The *Saguerus saccharifer* also, (called likewise *S. Rumphii*, and *Arenga saccharifera*,) when exhausted of its saccharine sap, yields Sago of good quality. *Caryota urens* and *Phœnix farinifera* also yield a Sago-like farina in India. It is, therefore, difficult to select one as the sole officinal species. Sago is also said to be produced by species of Cycas (*C. circinalis*, D. P.), but the statement has never been properly confirmed. Some *Zamias* are said to yield one kind of Arrowroot in the West Indies.

Sago is produced chiefly in the Moluccas and in Sumatra; but it is first imported into Singapore, in very large quantities, for granulation and re-exportation. It is first obtained by cutting and splitting the stem, washing and stirring it up with water, when the fecula becomes suspended, and is passed through a sieve. The fecula then subsides, and forms a powder like Arrowroot, but of a dirty-white colour; or *Meal Sago*, of which 500 or 600 lbs. may be yielded by a single tree. This, when imported into Singapore, is first well washed, partially dried, then passed through a sieve, and then again slowly along a cloth bag, which is kept in a state of vibratory agitation, during which it granulates. It is again sifted, and then roasted for a few minutes in iron pans which have been slightly rubbed with earth oil. After another sifting, the Sago is subjected to a final roasting. Common Sago was formerly of the size of Coriander Seeds, but unequal, and of a reddish or brownish-white colour, and mixed with some of the meal. It is formed of the Starch-globules of the meal aggregated together, but unbroken. The Chinese settled at Singapore, some time since, introduced these methods of refining and producing it in much smaller grains. This kind is now called Pearl Sago, and is in small grains about the size of a pin's head, hard, whitish, with a pearly lustre, sometimes even translucent, without odour, and with very little taste. It is sometimes bleached, and, having been subjected to heat, the Starch-globules are ruptured, so that even in cold water Iodine produces a blue colour with this Sago. Some fine Sago has been sent from Moulmein in Burmah.

M. Planche has arranged the Sagos of commerce under six different heads, according to the places whence they are procured. M. Gui-

bourt arranges them all under three heads. 1. Uncut Sago. 2. Seed Sago. 3. Tapioca Sago, which is the same as Pearl Sago. The unbroken microscopic grains of Sago are more or less of an ovoid form, but most appear as if truncated or mullar shaped. An imitation of Sago is made with Potato-starch near Paris. (*v. Amylum.*)

Sago is insoluble in cold water, but by long boiling becomes soft, and then transparent, and ultimately forms a gelatinous solution, which in all essentials corresponds with one of Starch.

Action. Uses. Sago is Nutrient and Demulcent, and well suited for invalids. May be boiled with water with milk, or in Soups.

Liliaceæ, *Dec.* Lilyworts.

The Liliaceæ as at present constituted include several groups, which are often treated of as distinct families, as *Tulipeæ,* including *Lilium candidum,* at one time officinal chiefly as a demulcent; *Hemerocallideæ; Asphodeleæ,* including Allium, Scilla; *Aloineæ,* the Aloe plants; *Asparageæ,* and others (*v.* Lindl. Veg. King. p. 200.) — The true Lilies are allied to Palms, also to *Melanthaceæ,* and to *Amaryllideæ.* They are widely diffused, but are chiefly found in temperate climates.

Allium, E. Allium sativum, *Linn.* Bulb of the Common Garlic.

Garlic is the *σκοροδον* of the Greeks, *Som* of the Arabs, and *Shumim* of Numbers xi. 12. It has been used as an article of diet, and likewise in medicine, from very early times.

In the L. P. of 1836 the bulb of the Leek, *A. Porrum,* was officinal; and in the last edition of the D. P., that of *A. Cepa,* the common Onion. Both have now been expunged, and the Garlic is retained only in the E. P.

The Garlic, Onion, and Leek are well-known as articles of diet, or rather as condiments. Their properties are very similar. The Garlic, when applied externally, will act as a Rubefacient; taken internally, it acts as a Stimulant, and as an Expectorant and Diuretic, producing at the same time a disagreeable odour in the breath. It is sometimes employed as an Anthelmintic in Ascarides.

Scilla, L. E. D. Urginea Scilla, *Steinheil.* (*Scilla maritima,* Linn.) Bulbus recens, L. Bulb, E. D. The officinal Squill.

The Squill (Σκίλλα) was employed by the ancient Greeks. The Asiatics substitute for it an allied species, *Urginea indica,* to which they apply the name of *iskeel.* From the difference in character of the officinal plant from the ordinary species of Scilla, M. Steinheil formed it into the genus Urginea. The name *Squilla* has also been applied to the same genus.

Bulb roundish-ovate, very large, half above ground; integuments greenish or reddish. Leaves all radical, appearing after the flowers, spreading, large, rather fleshy, broad, lanceolate, channelled, recurved. Scape from 2 to 4 feet high, rising from the centre of the leaves, simple, cylindrical, terminated by a long,

dense, ovate raceme of flowers, with long bracts. Flowers of a pale yellowish-green colour. Sepals 3, coloured, spreading. Petals very like them, and scarcely broader. Stamens 6, shorter than the perianth; filaments smooth, somewhat dilated at the base, acuminate, entire; anthers yellow. Ovary 3-parted, with 3 nectariferous glands at the apex. Style smooth, simple. Stigma obscurely 3-lobed, papillose. Capsule rounded, 3-cornered, 3-celled. Seeds numerous, in 2 rows, flattened, winged, with a membranous testa. (*Lindley.*) —Native of both the north and of the south sides of the Mediterranean and of the Levant. Flowers about August.—B. M. t. 918. Nees von E. 55. St. and Ch. 153.

The Squill bulb is formed of scales applied over each other, of which the external ones are dry, membranous, and often coloured; the inner colourless, thicker, and full of acrid viscid juice. It is sometimes imported in its entire state, packed in sand; the average weight is from half a pound to four, but it is occasionally ten pounds in weight, and as large as a child's head. Being in this state very retentive of moisture and of life, it is directed in the L. P. to be, like the Colchicum, preserved in dry sand; before drying, the dry outer coats are to be removed, and the others cut into transverse narrow strips, and dried with moderate heat. Squill is, however, usually imported in this latter state, the pieces being white or yellowish-white, often contorted, translucent, of a mucilaginous and bitter taste, at first rather tough, but when quite dry, brittle enough to be powdered. Many spiral vessels may be detected in these scales, by the microscope, as well as numerous acicular raphides. *Pulvis Scillæ* contains 9 or 10 per cent. of these crystals. Analysed, fresh Squill consists of Water (about $\frac{4}{5}$ths), with Gum, uncrystallizable Sugar, traces of Tannin, Phosphate of Lime, Lignin, and a bitter resinous Extractive, from which a peculiar principle called *Scillitine* has been extracted. Observers differ as to the nature of this principle. Probably more than one body has been included under this name; for some have found it to be uncrystallizable, neutral in reaction, and resinous in appearance; others have obtained crystals, which are said to be capable of neutralizing acids. Squill contains, also, in its extractive, a peculiar resinous *acrid principle*, to which perhaps its properties are mainly owing. They may be extracted by Alcohol, Spirits, and Vinegar.

Action. Uses. An irritant Poison. In small doses, Expectorant, Diuretic; and in larger, Emetic and Cathartic. Used as an Expectorant in chronic Catarrh; as a Diuretic in general Dropsy, especially when there is a deficiency of tone. Its effects may be increased by combination with other Diuretics and Expectorants. The powder may be given in doses of gr. j.—gr. iij. As Emetic, in gr. x.—gr. xv.

PILULA SCILLÆ COMPOSITA, L. D. Pil. Scillæ, E. Compound Squill Pill.

Prep. L. Mix *freshly dried Squill* in powder ʒj. with powdered *Ginger* and

powdered *Ammoniacum* āā ʒij. Then rub up with *Soft Soap* ʒiij. and *Treacle* ʒj., that a mass may be formed.
E. D. Twice as much Squill.

Action. Uses. Expectorant in doses of gr. v.—gr. xv.

Acetum Scillæ, L. E. D. Vinegar of Squill.

L. Digest *freshly dried Squill, bruised,* ℥ijß. in *Dil. Acetic acid* Oj. for 3 days with a gentle heat. Express, filter, and add *Proof Spirit* ℥jß.
E. Similar.
D. Same proportion of Squills; acid much stronger.

Action. Uses. Expectorant and Diuretic in doses of fʒß.—fʒj.

Oxymel Scillæ, L. Oxymel of Squill.

Prep. Evaporate *Vinegar of Squills* Oijß. over a slow fire, down to f℥xij. and mix with Honey ℔v., made hot.

Syrupus Scillæ, E. D. Syrup of Squill.

Prep. E. Dissolve *powdered White Sugar* ℔vij. in *Vinegar of Squill* Oiij., with the aid of a gentle heat and agitation. D. Similar.

Action. Uses. These preparations, though differently named, are very similar to each other, and the Honey of the one has probably little advantage over the Sugar of the other. Expectorant in doses of fʒj.—fʒij. Sometimes used as an Emetic for children in doses of fʒj.

Tinctura Scillæ, L. E. D. Tincture of Squill.

Prep. L. D. Macerate for 7 days dried and fresh *Squill* ℥v. in *Proof Spirit* Oij. Strain. E. Similar; or prepare by percolation, but without packing the pulp firmly in the percolator.

Action. Uses. Expectorant and Diuretic in doses of ♏x.—fʒß.

Aloe, *Linn.* Aloe.

Succulent plants, with spiked inflorescence. Perianth tubular, 6-cleft, sometimes so deeply divided as to appear 6-petaled, converging below into a tube, with the limb regular, spreading, or recurved, somewhat fleshy, nectariferous at the base; segments ligulate, the interior equal to or larger than the exterior, and imbricate. Stamens hypogynous, ascending, as long as the tube, or projecting beyond it. Style as long or almost wanting, 3-furrowed. Stigma simple or triple, minute, and replicate. Capsule membranous, scarious, obtusely or acutely triangular, 3-celled, 3-valved; valves bearing the septa in the middle. Seeds numerous, in two rows, roundish, flattened, or 3-cornered, winged or angled.

Aloe Barbadensis, L. E. Barbadoes Aloes. Produce of Aloe vulgaris, *var.* Barbadensis. Folii resecti Succus spissatus, L.

ALOE HEPATICA, L. D. (*Indica*, E.) Hepatic Aloes. Undetermined species of Aloe. Folii Succus spissatus ? L.

ALOE SOCOTRINA, L. E. Socotrine Aloes. Undetermined species of Aloe. Folii resecti Succus, aere induratus, L.

The word Aloe, in our translation of the Bible, is confounded with *ahila*, or Eagle-wood. (*v.* Ahalim, *Bibl. Cycl.*) Aloes were known to Dioscorides, to Galen, and to Celsus. The Arabs describe three kinds, Socotrine, Arabic, and Semegenic. The Indo-Persian writers give *Sibr* or *Sibbur*, as its Arabic, and *bol-seah* (black Myrrh) as its Persian name. The Hindoo *elwa* is very similar to the word *Aloe*, and the Greek *fekra* which the Arabs quote seems to be derived from *πικρος*.

Aloes is the bitter proper juice inspissated of several species of Aloe. It is contained in the vessels lying under the epidermis of their fleshy leaves, the interior being filled with much watery colourless sap. In many cases the leaves are cut into pieces and boiled with water, so as to form an extract rather than an inspissated juice; but both kinds are sold under the same name. That of commerce being derived from a variety of sources, is necessarily produced by different species. The Asiatic species, with those of Abyssinia and Socotra, are enumerated in the author's *Illustr. of Himal. Bot.* p. 389. The following may be referred to until more accurate information is available respecting the African and Arabian species.

ALOE RUBESCENS, *Dec.* Stem suffruticose. Leaves amplexicaul, spreading, thorny at the margin. Peduncle compressed, branched. Branches sub-bracteate.—*Pl. grass.* t. 15. A native of Arabia.

A. BARBADENSIS, *Mill.* Stem somewhat shrubby, offshoots from the root. Leaves sword-shaped, sinuato-serrate. Corol yellow. Var. of *A. vulgaris*, Nees von E. 50.—South of Europe, perhaps in the Peninsula of India. (Rheede, ii. t. 3.) Introduced into the West Indies.

A. ABYSSINICA, *Lam.* Subcaulescent. Leaves long and lanceolate, rather erect, hard, of a deep green colour, rather concave above; margin sinuato-dentate, reddish, flowers of a greenish yellow. Var. of *A. vulgaris*, Linn.—Abyssinia.

A. SOCOTRINA, *Lam.* Stem shrubby, thick, dichotomous. Leaves ensiform, greenish, incurved towards the apex, with the marginal serratures small, white, and numerous. Flowers scarlet at the base, pale in the middle, green at the point.—Nees von E. 50. St. and Ch. 110.

A. ARABICA, *Lam.* *A. variegata*, Forsk, with spotted leaves.

A. SPICATA, *Thunb.* Caulescent. Leaves flat, ensiform, dentate. Flowers spiked, campanulate, horizontal.—Interior of the Cape of Good Hope; probably yields some Cape Aloes.

"Ex hujus succo optima gummi resina aloes paratur: ex reliquis speciebus vilior." *Linn. fil.* But many other species grow in South Africa.

Dr. Christison remarks it as probable that *A. linguæformis* of Thunberg, and *A. commelini* of Willdenow likewise yield some Aloes.

ALOE INDICA, *Royle*. A low plant, with spikes of red flowers, which grows in dry barren places in N. W. India. This, if known to Roxburgh, was probably included by him in *A. perfoliata*. Col. Sykes has a species from the Deccan also with red flowers.

The Aloes in common use are the Socotrine, Hepatic, Barbadoes, and Cape Aloes.

Socotrine Aloes is distinguished by being of a redder colour when compared with the other kinds. This in the E. P. is described as "being of a garnet-red, in thin and translucent pieces." When quite dry, it is of a golden-red, but by exposure the colour is changed, and this Aloes becomes of a brownish-red. The fracture is conchoidal, usually smooth and shining, but sometimes a little rough. The odour is rather fragrant, especially when the Aloes is fresh and heated. It is easily reduced to a golden-yellow powder, and is nearly all soluble in Spirit of the Sp. Gr. 0·950. There can be no doubt that some of this Aloes is produced in the island of Socotra, as Lieut. Wellsted describes the plants as growing in parched and barren places at 500 to 3000 feet above the sea, and the leaves as being plucked and the juice allowed to exude into a skin. Specimens were procured for the author by a medical friend at Socotra, but unfortunately after his ship had been supplied, when two adulterated skins (those mentioned by Dr. Pereira) were supplied as genuine Socotrine Aloes. About two tons are exported annually from Socotra. Some used to be carried up the Red Sea, and thence into the Mediterranean. Ainslie states that a large quantity of Socrotine Aloes is prepared in the kingdom of Melinda, on the east coast of Africa; and some is said to be imported directly from Zanzibar. The semifluid pieces are dried in thin layers, and the inferior portions are strained in this country.

Hepatic Aloes, so called from its usual liver-brown colour, is referred to in the E. P. as *Aloe indica*, but is certainly not produced in India. This is evident from the specimens, all inferior in quality, in the author's collection, and those procured at his request by the late Dr. Malcolmson. The Hepatic, therefore, is the Aloes imported into Bombay from Arabia and Africa, and which is known in India by the name of Bombay Aloes. Some of it, if not all, is probably obtained from the same sources as the Socotrine, which it resembles in odour; and, as Dr. Pereira states, "the two are sometimes brought over intermixed, the Socotrine occasionally forming a vein in a cask of the Hepatic Aloes." It is of a liver-brown colour, has a dull, somewhat waxy fracture, and is less fragrant. The taste is nauseous and intensely bitter; the powder of a golden-yellow colour. This kind is inferior in quality to the fine Socotrine. The sources of these two kinds of Aloes are not known with certainty. *Aloe Socotrina* and *A. purpurascens* probably furnish at least a part. The juice is allowed to exude from the leaves, which are sliced transversely, or gently pressed with the hand.

Barbadoes Aloes is prepared in the West Indies, chiefly from the

variety of *A. vulgaris*, but also probably from *A. socotrina* and *A. purpurascens*, which are said to be cultivated there. Browne, in his *Nat. Hist. of Jamaica*, states that the largest and most succulent leaves are placed upright in tubs, that the juice may dribble out. This, evaporated, forms a kind of Aloes which is sold as Socotrine; but the common Aloes is obtained by expressing the juice out of the leaves, boiling it with water, evaporating and pouring into gourds, whence this kind is often called Gourd Aloes. It sells for a high price, is much in demand for veterinary medicine, and may be distinguished by its dark brown or blackish, sometimes liver-brown colour; by its usually dull appearance, and its disagreeable odour, especially when breathed upon. Being more gummy, it is tougher, and difficult to pulverize. It is said to be the most energetic, as a medicine, of all the kinds of Aloes.

Cape Aloes, procured no doubt from a variety of species of Aloe, is especially distinguished by its vitreous lustre, and is hence called *Aloe lucida* by some authors. The finer qualities are of a deep brown colour externally, with a tinge of olive-green ; thin laminæ are translucent, with something of a yellowish-red colour. It is very brittle, easily pulverized, its odour strong, rather disagreeable, and its powder of a yellow colour. Some of the inferior kinds are black in colour, vesicular, and with a rough fracture. Some Cape Aloes is yielded by *A. spicata*. Dr. Pappe, in his Cape Medical Flora, mentions several other species as yielding Aloes in different parts of the colony. He states that *A. ferox*, Lam., a native of Swellendam, yields the best. Some from *A. Africana*, Mill, is exported in large quantities from the eastern districts. But the Aloes commonly used at the Cape is that of *A. plicatilis*, Mill, which inhabits a mountain range near the Paarl.

Some inferior kinds of Aloes are produced in *India*. A kind called Mocha Aloes may come from *Arabia*. For Landerer states that much of the drug employed in the East is obtained from Arabia, where many species grow abundantly. Excellent Aloes is said to be produced in *Cyprus*, but not in sufficient quantity to be exported. And lastly, a small quantity is yielded in the island of *Curacoa*, in the Dutch West Indies.

All the kinds of Aloes have an extremely disagreeable taste, which is very permanent in the fauces. The odour is peculiar, and is more perceptible when the Aloes is breathed upon. A great portion of Aloes is dissolved by cold water; and much of what first appears insoluble is dissolved by boiling water, but again deposited on cooling.

Aloes has not yet been accurately analyzed. It contains some *vegetable albumen* (a trace in the transparent, more in the opaque kinds); and an acid, called *Aloesic'*, which resembles Gallic acid, but produces an olive-brown colour with a persalt of Iron. But it also contains *Resin* (about 30 per cent.), and a peculiar principle, called *Aloine*,—to either or both of which its purgative and tonic properties must be owing.

Aloine was first discovered by Meissner, and was obtained by the Messrs.

Smith from Barbadoes Aloes in 1851. It may be made by drying this Aloes, pounding it with sand to prevent it from agglutinating, macerating it then repeatedly in cold water, and evaporating the solutions *in vacuo* to a syrup. After standing for some time, small granular crystals are deposited, which are to be purified by several crystallizations out of hot water. Aloine is neutral, and has a very bitter taste. It requires for solution nearly 500 parts of cold water, and is also insoluble in cold alcohol, but it is readily dissolved by both when they are slightly warmed. If its solution be heated to 212°, it is rapidly oxidized and decomposed. It is soluble in alkaline fluids, forming a yellow solution, which gradually becomes darker. Digested for some time in strong Nitric acid, Aloine is converted into *Chrysammic acid.* This acid produces with Liquor Potassæ a deep red solution.

In many of its chemical characters, in its bitter taste, and perhaps also in its tonic properties, *Aloine* is analogous to *Rheine*, the peculiar principle of Rhubarb. Analyzed by Dr. Stenhouse, Aloine gave the formula $C_{34}H_{18}O_{14}+HO$. (P. J. xi. 458.)

Action. Uses. Aloes, in small doses, is Tonic; in larger, Cathartic. It is considered by some to stimulate the liver, and also to supply the place of the deficient bile in torpidity of the intestinal canal. Its action seems directed to the larger intestines, especially the rectum, and thus to be useful in evacuating them, but detrimental when there is already irritation or Hæmorrhoids. By this action it no doubt stimulates neighbouring organs, and becomes thus useful as an Emmenagogue.

Extractum Aloes, L. Extr. Aloes Aquosum, D. Extract of Aloes.

Prep. L. Macerate with a gentle heat for 3 days *Socotrine Aloes* ℥xv. in boiling *Aq.* Cj. Strain, and set aside for the dregs to subside. Pour off the clear liquor, and evaporate to a proper consistence.

D. *Hepatic Aloes* ℥iv. to *Water* Oij.

Extractum Aloes Barbadensis, L.

Prep. Same as above; Barbadoes Aloes being used.

By this treatment the mechanical impurities, and perhaps also the resin, are separated from the Aloes, and the product is supposed to be less irritant than the crude drug.

Action. Uses. Cathartic, in doses of gr. v.—gr. xv.

Pulvis Aloes compositus, L. Compound Aloes Powder.

Prep. Rub separately into powder *Aloes, Socotrine,* or *Hepatic* ℥jß., *Guaiacum* ℥j., and add *Comp. Cinnamon Powder* ℥ß.; mix.

Action. Uses. Warm Cathartic and Diaphoretic in doses of gr. x. —℈j.

Pilula Aloes composita, L. D. Compound Aloes Pill.

Prep. L. Beat into a pill mass *powdered Socotrine Aloes* ℥j., *Extract Gentian* ℥ß., *Oil of Caraway* ♏xl., and *Treacle* q. s. D. Similar.

Pilula Aloes cum Sapone, L. Pil. Aloes, E. Aloes and Soap Pill.

Prep. Rub together powdered *Extract of Barbadoes Aloes, Soft Soap,* and *Extract of Liquorice* āā, *Treacle* q. s., that a mass may be formed.
E. *Socotrine Aloes* and *Castile Soap* āā, *Conserve of Roses* q. s.

Action. Uses. Both Cathartic and Tonic, in doses of gr. x.—ʒß. The bitter and the Soap are thought to promote the action of Aloes.

Pilula Aloes cum Myrrha, L. E. D. Aloes and Myrrh Pill.

Prep. L. Rub together into a pill mass *powdered Socotrine* or *Hepatic Aloes,* ℥ß., *Saffron, powdered Myrrh,* and *Soft Soap* āā ʒij., and *Treacle* q. s.
E. D. Similar. No Soap.

Action. Uses. Cathartic and Emmenagogue in doses of gr. x.—℈j. every night.

Pilulæ Aloes et Assafœtidæ, E. Aloes and Assafœtida Pills.

Prep. Beat into a proper pill mass Socotrine or E. Indian *Aloes, Assafœtida* and *Castile Soap* āā, with *Conserve of Red Roses,* q. s.

Action. Uses. Cathartic and Antispasmodic in doses of gr. x.—gr. xv. thrice a day.

Pilulæ Aloes et Ferri, E. Aloes and Iron Pill.

Prep. Pulverize separately *Barbadoes Aloes* 2, and *Sulphate of Iron* 3 parts; add *Aromatic Powder* 6, and *Conserve of Red Roses* 8 parts. Mix and beat into a proper mass; divide into 5 grain pills.

Action. Uses. Chalybeate Tonic and Laxative in doses of gr. x.—gr. xv. The conjunction of the Iron with the Aloes assists the action of the latter, besides being itself useful in some cases of Amenorrhœa.

Decoctum Aloes compositum, L. D. Decoct. Aloes, E. Compound Decoction of Aloes.

Prep. L. Boil *Extract of Liquorice* ʒvij., *Carb. Potash* ʒj., *Extract of Aloes,* powdered *Myrrh,* and *Saffron,* āā ʒjß., in *Aq. dest.* Ojß. till only Oj. remains, Filter, and add *Compound Tincture of Cardamoms* f℥vij.
E. Similar. D. More aloes.

Action. Uses. Cathartic; Emmenagogue in doses of f℥ß.—f℥ij. The boiling must not be carried to any extent, as some of the Aloes will then become insoluble.

Vinum Aloes, L. E. Wine of Aloes.

Prep. L. Macerate powdered *Aloes* (Socotrine, or Hepatic) ℥ij., and *Canella* ʒiv. in *Sherry Wine* Oij. for 7 days. Strain.
E. *Aloes* ℥jß.: no *Canella; Cardamoms* and *Ginger* āā ʒjß.

Action. Uses. Warm Cathartic in doses of f℥ß.—f℥j.

Tinctura Aloes, L. E. Tincture of Aloes.

Prep. L. Macerate for 7 days coarsely powdered *Socotrine* or *Hepatic Aloes* ℥j. in *Aq. dest.* Ojß. and *Rectified Spirit* Oß.; then add *Extract of Liquorice* ℥iij.

that it may be dissolved. Strain. E. Similar. Not conveniently prepared by percolation.

Action. Uses. Cathartic adjunct to Purgative or Emmenagogue draughts in doses of f℥ß.—f℥ij. The weak Spirit is an excellent solvent of the active properties.

TINCTURA ALOES COMPOSITA, L. Tinct. Aloes et Myrrhæ, E.

Prep. Macerate for 7 days coarsely powdered *Socotrine* or *Hepatic Aloes* ℥iv., *Saffron* ℥ij., in *Tincture of Myrrh* Oij. Strain. E. Similar. Not well prepared by percolation.

Action. Uses. Emmenagogue. Stimulant Cathartic, and adjunct to draughts and mixtures, in doses of f℥ß.—f℥ij.

ENEMA ALOES, L. Enema of Aloes.

Prep. Mix and rub together *Aloes* ℈ij., *Carb. Potash* gr. xv. and *Decoct. Hordei* Oß.

Used to dislodge Ascarides from the rectum, and in Amenorrhœa.

Aloes is an ingredient of the Pilulæ Cambogiæ, Pil. Cambogiæ Comp., Extr. Colocynthidis Comp., Pil. Colocynthidis et Hyoscyami, Tinct. Benzoini Comp., Pil. Rhei Comp., and Tinct. Rhei et Aloes.

MELANTHACEÆ. *R. Brown.* (*Colchicaceæ.*)

The Melanthaceæ are allied to Junceæ and to Liliaceæ, are found in temperate parts of the world, and are remarkable for secreting Veratria.

COLCHICI CORMUS ET SEMINA, L. E. D. Cormus and Seeds of Colchicum autumnale, *Linn.* Colchicum, or Meadow Saffron.

Colchicum is well described by Dioscorides. It was used by the Arabs, and is their *sorinjan;* they give *kuljikoon* as its Greek name. The Hermodactyls (Sweet and Bitter *sorinjan* of the Arabs) of the later Greeks and Arabs were no doubt species of this genus. The author's specimens have been described by Dr. Pereira.

The true root is fibrous, and below the underground stem or cormus (the bulbo-tuber of some authors), which is ovate, about the size of a chesnut, solid, fleshy, enveloped in a brown-coloured tegument. It is rather convex on one side, flattened on the other, or with a longitudinal furrow made by the growing plant. It is largest and in full perfection in June or early in July, when a new but minute corm is seen at its lower end close to the radicles. This new corm flowers in autumn, is then small, but enlarges before spring, when the young seed-vessel rises with the leaves, having remained underground from the time of flowering in autumn. The seeds ripen about midsummer. The parent corm becomes more spongy and watery as the new flower rises, but retains its size and form till next April, the second spring of its own existence. But by the end of May it has become shrivelled and leathery, and is attached to the lower part of its progeny, now the perfect and full-sized corm. In Scotland, where the seeds do not ripen, the plant propagates itself by little corms being thrown off from the large corm during the second or last spring of its existence. The leaves are broadly lanceolate, flat, somewhat keeled, about a foot in length, dark green, smooth, and appearing in the spring with the capsules. Flowers several, leafless, rising from the corm with a long white tube; limb of a pale

purple or rose-colour. Perianth funnel-shaped, with a very long tube; limb 6-parted, petaloid. Stamens 6, inserted into the throat of the perianth. Capsules 3, connected throughout, 1-celled (fig. 1 and 4), opening at the inner edge (2), many-seeded. Seeds (fig. 5) roundish, with a brown shrivelled skin, and large strophiole, which gives them a rough appearance.—Native of moist meadows throughout Europe.—Nees von E. 49. St. and Ch. 70.

Dr. Christison has given the fullest and best account of the growth of the corms of the Colchicum, which the author has above very much abridged. Its activity is considered to be greatest in July and August, that is, when the leaves have withered and the flowers of the new corm have not appeared. Thus the L. C. directs that the corm be "dug up in the month of July, or before the autumnal bud has developed." Dr. Lindley says he has seen many *cwt.* sent to town of those which had flowered; and the flowers broken off, so as to prevent the circumstance from being observed. Dr. C. observes, that the corm is whitest, firmest, and largest at the end of June and beginning of July; that it then abounds in Starch, and there is no other corm connected with it. But if taken up in April, two are found united, one spongy, the other plump and firm. Though they are generally collected when the corm is single, large, and plump, Dr. C. doubts whether this is essential, as the corm in April, though more watery, is at least as bitter; and he quotes Stolze as showing that in autumn the corm contains of water 80 per cent., Starch 10, Bitter Extract 2, and Sugar 4, with a little Gum, Resin, and Lignin; but in April the proportion of Bitter Extract is greater. In the L. P. it is directed to be kept in sand, and to have its brownish integuments removed. It is then to be cut into thin transverse slices, and dried, first with a gentle heat, slowly increased to a temperature of 150°. The slices should be dry, firm

Fig. 92.

in texture, and of a greyish-white colour, and should readily change their colour to blue when moistened with vinegar and touched with Tincture of Guaiacum, as pointed out by Dr. A. T. Thomson. (This colour is produced by Gluten.) The taste is disagreeable, bitter, and somewhat acrid. The seeds have the same properties, and, if collected ripe, are necessarily more uniform.

According to Pelletier and Caventou, the corm contains an alkali (supposed by them to be Veratria), united with an excess of Gallic acid, Fatty matter united with a volatile acid, Yellow Colouring matter, Gum, Starch, Inulin in abundance, and Lignin. But Geiger and Hesse announced the presence of a peculiar alkali, *Colchicina.* This very much resembles Veratria; but it is said to differ from it in being soluble in water, and crystallizable. The active principles of Colchicum are partially taken up by water; but readily by Alcohol, diluted Spirit, and Vinegar, which are used as the officinal solvents.

Action. Uses. Colchicum is Irritant, and in large doses a Narcotic Acrid Poison. In small doses repeated, it stimulates some of the secretions, and acts as a Nauseant and Cathartic, Diuretic, and Diaphoretic, producing at the same time Sedative and Anodyne effects; thus relieving the pain of Gout and Rheumatism, and controlling the action of the heart in Inflammatory diseases. It is doubtful whether its full effect as a medicine is experienced until some of the inconveniences attending its use are felt, as slight colic and diarrhœa, or headache and giddiness,—and then the doses should be diminished.

Colchicum is supposed to have been the active ingredient of a once celebrated French nostrum for Gout, the *Eau médicinale d'Husson.* (P. J. xi. 436.)

D. The corm (bulb) or the powdered seeds may be given in doses of gr. j.—gr. v. 3 times a day, with aromatics and sometimes a little opiate. Mr. Wigan recommends it in 8 grain doses every hour, until either vomiting, purging, or sweating, are experienced.

Extractum Colchici, L. Extract of Colchicum.

Prepared from the fresh corms of the Colchicum, like Extr. Aconiti, L.

Action. Uses. An efficient preparation in doses of gr. j. every three or four hours.

Extractum Colchici Aceticum, L. E. D. Acetic Extract of Colchicum.

Prep. L. Bruise fresh *Corms* of *Colchicum* ℔j., and gradually add *Acetic acid* f℥iij. Express the liquid, and evaporate it, unstrained, to the due consistence.

E. Similar, with *Pyroligneous acid.*

D. The *dried Corm* ℥iv. to *dil. Acet. acid* f℥viij. The liquid is filtered before evaporation, to separate starch.

Action. Uses. Anodyne, &c. in Gout and irregular Rheumatism, in doses of gr. j.—gr. iij. three or four times a day.

ACETUM COLCHICI, L. E. D. Vinegar of Colchicum.

Prep. L. Macerate *dried Colchicum Corm* ℥iijſs. with *dil. Acet. acid* Oj. in a closed vessel for 3 days; then express and set aside, that the dregs may subside; lastly, add to the strained liquid *Proof Spirit* f℥jſs.
E. Similar. *Fresh Corms* used (three times the quantity). Same strength.
D. *Dried Corm* used, 3 times as much as in L. Three times as strong.

Action. Uses. A mild but efficient preparation in doses of fʒſs.—fʒij. every three or four hours.

VINUM COLCHICI, L. E. Wine of Colchicum.

Prep. Macerate for 7 days dried and sliced *Colchicum Corms* ℥viij. in *Sherry Wine* Oij. Strain.

Action. Uses. Irritant, &c. Sedative in doses of ♏x.—fʒj. three times a day. The Wine of the Seeds is preferred by some (Seeds ℥ij. to Sherry Wine Oj.) in the same doses.

TINCTURA COLCHICI, L. E. Tinct. Seminum Colchici, D. Tincture of the Seeds of Colchicum.

Prep. L. Macerate for 7 days bruised *Colchicum Seeds* ℥v. in *Proof Spirit* Oij. Strain.
E. D. Similar. Prepared by percolation, E.

Action. Uses. As the seeds are more uniform in strength than the corm, and as Proof Spirit is a good solvent, this and the wine of the seeds are preferred by many practitioners in doses of ♏xv.—fʒj.

TINCTURA COLCHICI COMPOSITA, L. Compound Tincture of Colchicum.

Prep. Macerate for 14 days *bruised Colchicum Seeds* ℥v. in *Aromatic Spirit of Ammonia* Oij. Express and strain.

Action. Uses. Recommended by Dr. Williams in cases where Acidity prevails, in doses of ♏x.—f ʒj.

VERATRUM, L. Veratrum album, *Linn.* Rhizoma; Rootstock. White Hellebore.

White Hellebore is believed to be the Ἐλλεβόρος λευκός of Dioscorides, the *Khirbuk abiuz* of the Arabs.

Rootstock rugose, oblong, præmorse, rather horizontal; when dry it is of a brownish colour on the outside, but internally of a greyish colour, with long cylindrical radicles. The stem is 1½ to 4 feet high. Leaves plicate, elliptic, or elliptico-lanceolate, pubescent below, passing obliquely into the sheath. Racemes paniculate, terminal, pubescent. Flowers polygamous, yellowish-white, green at the back. Segments of the 6-parted perianth oblong-lanceolate, denticulate, without glands at the base, spreading, much longer than the pedicel. Stamens 6, inserted into the base of the segments; anthers reniform, opening transversely. Ovary with 3 spreading stigmas. Capsules 3, united below, horned above, separating into 3 many-seeded follicles Seeds compressed, or winged at the apex. — Meadows in the south of Europe, and also in central Europe. Nees von E. 46. St. and Ch. 136. *Veratrum Lobelianum* may be used for the same purposes.

All parts of this plant are acrid and poisonous; but the rootstock with its radicles is alone officinal. It seems when first tasted a little sweetish, but its bitter and acrid disagreeable taste soon overwhelms every other. They are usually imported from Germany, and are rough with the remains of the detached radicles. The properties depend chiefly on the presence of *Veratria*, but another alkali has been detected by E. Simon, which he has called *Jervine*, from the Spanish word signifying poison. The other constituents resemble those of the Cormus of Colchicum.

Action. Uses. Irritant Poison. Applied to the nose, it produces sneezing and coryza, and when taken internally, vomiting and purging. It used to be employed as a Hydrogogue Cathartic, and before Colchicum as an Anodyne in Gout. It is now chiefly employed to destroy vermin infesting the skin or hair; sometimes as an Errhine, one or two grains being mixed with Starch or Florentine Iris.

VINUM VERATRI, L. Veratrum Wine.

Prep. Macerate *sliced white Hellebore* ℥viij. in *Sherry Wine* Oij. for 7 days. Strain.

Action. Uses. Emetic, Cathartic, Anodyne. Sometimes used in Gout and Rheumatism in doses of ♏x. thrice a day, with a little Laudanum.

SABADILLA, E. Asagræa officinalis, *Lind.* (Fruit of Veratrum Sabadilla, *Retz.*, of Helonias officinalis, *Don*, and probably of other Melanthaceæ, E.) Cevadilla.

Sabadilla, Cevadilla, or Cebadilla, (from *Cebada*, the Spanish for Barley, from the resemblance of its flowering spike to an ear of barley), was known to Monardes in 1573. Its seeds, or rather fruits, have been occasionally employed for the destruction of vermin; they are now recognized as the source for obtaining the alkali Veratria. Cevadilla was long supposed to be the fruit of *Veratrum Sabadilla*, Retz., but Schiede discovered that it was produced in Mexico by a different plant, which was first referred to Veratrum, then to Helonias, and is now formed into a new genus, Asagræa.

ASAGRÆA OFFICINALIS, *Lindl.* Bulbous. Plants cæspitose. Leaves linear grass-like, tapering, smooth, channeled above, carinate below, 4 feet long, lax. Scape naked, 6 feet high, simple. Raceme very dense, 1½ foot long. Flowers polygamous, racemose, naked, yellowish-white. Perianth 6-partite; segments linear. Stamens alternately shorter; anthers cordate, after dehiscence shield-shaped. Ovaries 3, simple. Stigma obscure. Follicles 3, papery. Seeds scimetar-shaped, winged.—Eastern side of the Mexican Andes.—Nees von E. Suppl. 4.

This plant is officinal in the L. P. for the preparation of Veratria.

VERATRUM SABADILLA, *Retz.* Is chiefly distinguished from Asagræa by the fruit in the latter being crowded round the stem, while in this plant they are few in number and attached to one side only.—A native of Mexico and of the West Indies.—Nees von E. 48.

Cebadilla or Sabadilla seeds, as they are called, consist of the loose seeds and the 3-celled, thin, dry follicles, of a reddish-grey colour, which are either empty, or contain each two brownish-black seeds, without odour, but having a bitter, acrid, and persistent taste. Analysed by Pelletier and Caventou, they were found closely to resemble the corm of Colchicum in composition, as they contain Fatty matter composed of Stearine, Elaine, and Cevadic acid, Wax, Veratria in combination with an excess of Gallic acid, Yellow Colouring matter, Starch, Lignin, Gum, with some saline substances. (*v.* Merat and De Lens.) A more elaborate analysis has been given by Meissner.

Action. Uses. Anthelmintic.

VERATRIA, L. E. Alkali prepared from the seed of *Asagræa officinalis*, L.

Veratria was first discovered in the Sabadilla seeds, and subsequently in the rootstock of *Veratrum album*, and in both in combination with Gallic acid in excess.

This alkaloid is now placed in the Mat. Med. of the L. P.

Prep. L. P. 1836. Boil *Cebadilla Seeds bruised* ℔ij. with *portions of Spirit* Cj. three times (Gallate of Veratria, Colouring matter, and some other compounds are dissolved). Press, and distil the Spirit, so that the residue be brought to the consistence of an extract. To this, boiled in water three or more times, *dil. Sul'* is added. (Sulph. Veratria is formed). The mixed liquors are evaporated to the consistence of a syrup, when *Magnesia* is added to saturation, frequently shaking: (the Sulph. of Veratria is decomposed, and the Veratria precipitated, but mixed with other substances). The precipitate is digested in *Spirit:* (the Veratria is dissolved). The Spirit is distilled off: the residue is boiled in water for a ¼ hour, and a little *Sul'* and *animal Charcoal* being added, again boiled and strained: (the Sulph. Veratria is formed and freed from colour). The liquid is then evaporated to the consistence of syrup, and *Sol. of Ammonia* q. s. added. (The Veratria is precipitated, and Sulph. Ammonia remains in solution.) The Edinburgh process is essentially the same, but differs slightly in details.

Veratria is pulverulent and not crystallizable. When melted, it becomes on cooling a transparent yellowish mass; and burns entirely away when ignited in the air. In cold water it is nearly insoluble; boiling water takes up only 1-1000th of its weight, and the solution is acrid; Alcohol dissolves it readily, and Ether but sparingly. It restores the blue colour of Litmus, and forms neutral salts with acids, which crystallize with great difficulty. Pure Veratria is reddened by strong Sulph. acid; and forms with Nit. acid a yellow solution. Its solutions are precipitated by Ammonia and by tincture of galls. According to Couerbe, the Veratria of commerce contains, besides Veratria, another peculiar principle, called *Sabadillina*, and 2 distinct resinous bodies. Veratria is composed of $C_{34}H_{22}O_6N=288$. "It dissolves but slightly in water, is more soluble in Ether, but most so in Rectified Spirit. It has no smell, but it irritates the nostrils excessively, and has a bitter taste. It is to be cautiously administered." L.

Action. Uses. Irritant Poison. In small doses, applied externally, acts as a Rubefacient; also as an Errhine; excites violent sneezing; taken internally, excites nausea, vomiting, and purging; has been applied externally in Neuralgia, Rheumatism, and Gout, after the acute symptoms have been mastered. In doses of $\frac{1}{12}$ of a grain, it has been given internally in Gout, Rheumatism, and painful nervous affections, as a substitute for Colchicum.

SMILACEÆ, *R. Brown.* Sarsaparillas.

They are found in the temperate and tropical parts of Asia and America, but also beyond these limits. They are chiefly remarkable for yielding the root called Sarsaparilla.

SMILAX, *Linn.* *Diœcia Hexandria*, Linn.

Diœcious. Perianth 6-partite, nearly equal, spreading (female persistent). Stamens 6, inserted into its base. Anthers linear, erect. Ovary 3-celled. Cells 1-seeded. Style very short. Stigmas 3, spreading. Berry 1—3-seeded. Seeds sub-globular. Albumen cartilaginous. Embryo very small, remote from the umbilicus. — Evergreen climbing shrubs. Root fibrous or tuberous. Stems often prickly. Leaves alternate, petiolate, cordate or hastate, reticulate, venose; cirrhiferous stipules between the petioles. Flowers sessile on a globular receptacle, subcapitate, pedicellate, or umbellate. A few grow in temperate, but the majority in warm and tropical regions of both hemispheres.

SARSA, L. E. Sarsaparilla, D. *Jamaicensis*, L. D. Smilax officinalis, *Kunth.* Radix; the Root. Sarsaparilla.

The word *Smilax* occurs in Greek authors, and their plant, *Smilax aspera*, continues to be employed in medicine. The name Sarsaparilla (from the Spanish *Sarsa*, a bramble, and *Parilla*, a vine) is applied to species of the same genus, and to their roots, first introduced into Europe from the New World in the 16th century. Several kinds, as Jamaica, Honduras, Brazilian, &c., are known in commerce; but it is extremely difficult, if not impossible at present, to determine the species of *Smilax* which yield the several varieties of drug, because much of it is brought over by the Indians from the little known Mosquito coast to Jamaica, and thence imported into this country: the greater portion of the remainder being imported from Mexico, Guatemala, Brazil, and Peru.

SMILAX OFFICINALIS, *H. B.* and *K.*, was discovered by Humboldt and Bonpland in New Granada on the banks of the Magdalena, in Columbia. As its roots are collected by the natives, called *Zarzaparilla*, and taken to Cartagena, and thence exported to Jamaica, it is more than probable that this yields some of the Sarsaparilla of commerce; hence it is adopted in the Pharmacopœias. Dr. Pereira concludes it to be probably the source of Jamaica Sarsaparilla. Martius states that, according to Pohl, the roots are collected in the western parts of the province of Minas Geraes.

S. SARSAPARILLA, *Linn.* is a native of the United States of America; but it does not, according to the evidence of American authors (*v.* Wood and Bache), yield any of the Sarsaparilla of commerce.

S. PAPYARCEA, *Poir.* (S. syphilitica, *Mart.* non Humb.) is a native of Brazil. Martius ascertained that its roots were collected by the Indians on the Rio Negro and other places in the vicinity of the Amazon river, and that they form the *Salsa, Salsaparilha, Sarza,* or *Zarza,* which is named the Sarsa of Maranhao, of Para, and of Lisbon, and that it abounds more than the others in Parigline.*

S. SYPHILITICA, *Willd.*, is a distinct species, found by H. and B. on the Rio Cassiquiare, in Brazilian Guiana.

S. MEDICA, *Schlecht,* was found by Schiede on the eastern slope of the Mexican Andes. The roots are dried and exported from Vera Cruz, but are little known here.

S. ASPERA is a native of the East. At the bazaars of Constantinople and Gallipoli, according to Landerer, its stalks and yellow and black fruits are sold as Sarsaparilla, and thought even to excel the genuine officinal kind in efficacy.

Dr. Hancock states that there is but one species that yields genuine Sarsaparilla which manifests to the taste any of the sensible properties of Sarsaparilla; and this grows chiefly on the elevated lands of the Rio Imiquem, at Unturana and Caraburi; also that the Sarsa of the Rio Negro, which comes by way of Angostura or Para, is the best. This is probably yielded by the above *S. papyracea.* Several other species are, however, enumerated by Martius, as *S. Japicanga, brasiliensis,* and also *Herreria Salsaparilha,* as employed for the same purposes, and he says "Recentes multo efficaciores, quam exsiccatæ, vetustæ." So *S. Cumanensis,* the *Azacoreto* of the natives, *S. cordato-ovata* of Pöppig, *S. Purhampuy,* referred doubtfully to *S. officinalis* by Dr. Lindley, *S. China,* yielding the *China-root* of the shops, long famed in the East. It is probable that some of the Indian species are possessed of similar virtues. (*v. Himal. Bot.* p. 383.)

Sarsaparilla roots are usually imported in bundles, formed of the roots folded up,—or unfolded, as in the Brazilian variety,—frequently still adhering to the *rhizoma* (chump of druggists). These roots are flexible, several feet in length, about the thickness of a quill, cylindrical, but wrinkled longitudinally, with radicles attached along their length. The colour varies, probably owing to adventitious circumstances. They are composed of a thick cellular cortex, covered by a thin epidermis; of the meditullium or duramen, an inner layer of ligneous intermixed with cellular tissue; and of a central pith, often containing Starch, in the interior. Hence a transverse section resembles one of an exogenous stem without medullary rays. Sarsaparilla is without odour, often with little else than a mucilaginous taste; but when good and fresh it is a little bitter, nauseous, and acrid, a taste which affords, according to Dr. Hancock, the best criterion of its goodness. The roots are often split up the middle and cut into short pieces, for the facility of making preparations. In this it is more difficult than in the entire state to distinguish the different kinds.

Jamaica Sarsaparilla, which is usually the most esteemed, is in bundles of from 12 to 20 inches in length, and from 4 to 5 in breadth. It is distinguished from other kinds by its reddish colour, and by having more rootlets attached to it; hence it is sometimes called *red-*

* "Ejus radices præ cæterarum Smilacum pollent materia illa extractiva, saporis amaricantis, fauces vellicantis, *Parillinum* dicta, cui efficacia medicaminis præcipue debetur."

bearded Sarsaparilla. It is less mealy, but yields more extract, than the other kinds, and the bark is said to afford five times more than the woody part. (Pope.) Its powder is of a reddish colour, and does not produce so blue a colour as the Honduras, and similar kinds, when tested with Iodine. Jamaica Sarsaparilla is the kind intended by the Pharmacopœias.

Brazilian, called also *Lisbon* and *Rio Negro* Sarsaparilla, ought to be of as good quality as any other, if yielded by the above *S. papyracea*, for this, according to Martius, has the sensible properties more marked than other species. It may be the plant alluded to by Dr. Hancock. Some is yielded perhaps also by the *S. cordato-ovata.* The roots are in bundles of from 3 to 5 feet in length, and not folded up, nor with the chump attached; are less wrinkled longitudinally, have fewer radicles, a reddish-brown colour, and are amylaceous.

The *Honduras* Sarsaparilla is greyish-brown in colour, and, like the last, has but few radicles attached, is very amylaceous, so as to appear mealy when broken, and becomes blue when either its powder or decoction is tested by Iodine. The bundles are folded, and the chump is sometimes found.

Lima Sarsaparilla, though originally brought from Lima, is also imported from Valparaiso and Costa Rica (*Per.*). On account of its resemblance to Jamaica Sarsaparilla, it is often sold for it. It is folded in bundles 3 feet long and 9 inches across, having the chump still attached, and contained in the interior.

A fifth kind, called *Vera Cruz* or *gouty Sarsaparilla*, is said to be exported from the Caraccas, in South America. The roots are folded; they are coarse, thick, and amylaceous, and have the chump attached.

Sarsaparilla roots are sometimes adulterated, and the inferior are often passed off for superior kinds. The roots of *Agave*, and of *Furcræa*, also of *Herreria stellata*, and *Aralia nudicaulis*, and even the stems of Dulcamara and of the Hop, are substituted. Those of *Phormium tenax* have been likewise used for Sarsaparilla.

Sarsaparilla contains much Lignin, Starch, and Mucilage, a little Acrid Bitter Resin, a trace of Volatile Oil (which has the odour and acrid taste of Sarsaparilla), and a peculiar principle, which has been variously named. *Smilacine* is white, crystallizable, without odour, but with a bitterish taste; very slightly soluble in cold, more so in boiling water; soluble in hot spirit, also in Ether and Oils. Strong Sul′ turns it first red, and finally yellow. HCl dissolves it, and becomes red. As Smilacine is neutral, and forms no definite compounds, its composition is uncertain. The active properties of Sarsaparilla are taken up both by hot and cold water, but are impaired by long boiling. They are also extracted by diluted Spirit; a little addition of this, in making its preparations, is probably useful, but long boiling is positively injurious.

Action. Uses. Alterative, Diaphoretic; will sometimes create

nausea and vomiting. Improves the state of the constitution, slightly strengthens and induces plumpness in Cachectic cases, and in depraved states of the general health; useful in secondary Syphilis and Mercurio-Syphilitic cases. Many ascribe its supposed good effects to the care bestowed on the comfort and diet of the patient.

DECOCTUM SARSÆ, L. E. D. Decoction of Sarsaparilla.

Prep. L. Boil *Sarsaparilla* ℥v. in *Aq. dest.* Oiv. down to Oij., and strain.
E. D. Similar; but the root is first digested in the water for some time.
In the L. P. of 1836 a tedious process was prescribed: first, long boiling, then taking out and bruising, then boiling again. It was said to have been prompted by an erroneous notion that the activity resided in the woody fibre of the root.

Action. Uses. Alterative. Much used in doses of f℥iij—f℥vj. two or three times a day.

DECOCTUM SARSÆ COMPOSITUM, L. E. D. Comp. Dec. of Sarsaparilla.

Prep. L. Boil together for ¼ of an hour *boiling Decoction of Sarsa* Oiv., sliced *Sassafras*, rasped *Guaiacum Wood*, and bruised fresh *Liquorice root* āā ʒx., *Mezereon* ʒiij. Strain. E. D. Similar.

Action. Uses. Alterative. A substitute for the *Lisbon diet drink*, in doses of f℥iij.—f℥vj. two or three times a day.

EXTRACTUM SARSÆ LIQUIDUM, L. E. D. Fluid Extract of Sarsaparilla.

Prep. L. Boil *Sarsaparilla* ℔iijß., in *Dist. Water* Ciij. down to Oxij.; pour off the liquor and strain while hot; again boil the residue in *Dist. Water* Cij., and strain. Evaporate the mixed liquors to f℥xviij., and, when the extract has cooled, add to it *Rect. Spirit* f℥ij.
E. D. Similar; but about one third of the strength of the L. prep.

Action. Uses. Alterative in doses of fʒß—fʒij. with water, flavoured as agreeable. It may be preserved for any time.

SYRUPUS SARSÆ, L. E. Syrup of Sarsaparilla.

Prep. L. Boil *Sarsaparilla* ℔iijß. in *Aq. dest.* Cij. down to Cj.; pour off and strain, hot. Again boil the residue in *Aq.* Cj. down to ½, and strain. Evaporate the mixed liquor to Oij. and dissolve in it *Sugar* ℥xviij. Lastly, when cool, add *Rect. Spirit* f℥ij.
E. About one-third as much *Sarsaparilla.*

Action. Uses. Alterative in doses of fʒiv. with water, or added to the Decoction.

ORCHIDEÆ, Juss. Orchids.

The *Orchideæ*, though so interesting to horticulturists, are of little importance for their uses. The Vanilla, however, is remarkable for its aromatic fragrance, and some of the family yield the highly nu-

tritious tubers known by the name of Salep, Salop, and Saloop. This name seems to be derived from the Arabic *Salib.* Their radical tubers are hard and horny in appearance, whitish, semi-transparent, with little odour, but a mild mucilaginous taste. They are composed chiefly of Bassorin, with some soluble Gum, and a little Starch, and are considered by many as containing the largest portion of nutritious matter in the smallest space possible. The plant yielding the finest kind, a produce of the Persian region, is imperfectly, if at all known. A plant brought to the author from near Cashmere he named *Eulophia vera*, and he himself prepared some very good Salep from the tubers of *E. campestris*, found at the foot of the Himalayas in North West India (*v.* Himal. Bot. p. 370). Dr. Falconer informs the author that he was told by Dost Mahomed that the finest Salep is produced near Candahar. Sprengel considers *Orchis papilionacea* to be the Orchis or Salep of the ancients. M. Beissinhirtz says that *Orchis morio*, *mascula*, and *militaris*, yield the best Salep in Europe. Dr. Cullen writes, "I have seen it prepared in this country from *Orchis bifolia*, as pure and as perfect as any that comes from Turkey."

Salep forms a nutritious and unirritant diet for the sick, convalescents, or children, boiled with water or milk, and flavoured as Sago and other farinaceous foods.

CANNEÆ, *R. Brown.* *Marantaceæ*, Lindl.

The Canneæ resemble Musaceæ in habit, and are very closely allied to Scitamineæ. They are found in tropical parts of Asia and America, and are destitute of aroma, but remarkable for the secretion of Starch.

MARANTA, L. E. D. Maranta Arundinacea, Linn. (and M. indica, *Tussac.* E.) Tuberis Fæcula, L. Fecula of the Tubers and Rhizome, E. Arrowroot. *Monandria Monogynia*, Linn.

The fecula, root-stocks, and tubers of this plant, have long been familiar to the inhabitants of S. America; but West Indian Arrowroot has only been used in England during this century.

Rootstock white, horizontal, annulated, from which proceed root-fibres, some of which swell into tubers, and become jointed stocks, similar to the rhizoma, but covered with scales. These often elongate, curve upwards, and rising out of the ground, become new plants. (*v.* Nees and Ebermaier, Pfl. Med. 69 and 70.) Stem 2—3 feet high, much branched, slender, finely hairy, tumid at the joints. Leaves alternate, with long, leafy, hairy sheaths, ovate, lanceolate. Panicles terminal, lax, spreading, with long, linear, sheathing bracts at the ramifications. Calyx green, smooth. Corolla white, small, unequal, one of the inner segments in the form of a lip. Anther attached to the petal-like filament. Style hooded, petal-shaped. Ovary 3-celled, smooth. Stigma 3-sided. Fruit even, dry, 1-seeded.

The Starch, or Arrowroot, is obtained by beating into a pulp one-year old tubers (the Rhizoma does not seem to be used, either of this or of the Curcumas, *q. v.*), then throwing this into water, agi-

tating and straining it so as to separate the amylaceous from the fibrous portion. The Starch suspended in the water gives it a milky appearance. When allowed to stand the fecula subsides, is washed with a fresh portion of water, and afterwards dried in the sun. It is then snow-white, and is composed of minute granules, which are seen by the microscope to be more or less elliptical in form, often like a mullar in shape, rarely quite spherical or ovate. Many are only a 2000th, others as much as a 750th of an inch in length.

Some Arrowroot is also produced in the West Indies by a plant there called "Tous les Mois," referred to in the E. P. as "An imperfectly determined species of Canna." This by some, as Dr. Waterson of St. Kitt's, is stated to be *C. coccinea.* Dr. Hamilton describes it as cultivated at Barbadoes, St. Kitt's and the French islands, as attaining in rich soils a stature of fourteen feet, and having tuberous roots, equal in size to the human head. He suspects it may be identical with the Achira of Choco. This is the *Canna edulis* of the Bot. Reg. ix. 775. This plant is therefore officinal in the D. P. The starch grains of Tous les Mois are very large.

In India, *Maranta arundinacea* has been successfully cultivated near Calcutta. Some Arrowroot is yielded by another species, *M. ramosissima.* Besides these, much (called *East Indian Arrowroot*) is yielded by *Curcuma angustifolia*, *leucorhiza*, *rubescens*, &c.; but the greater portion of the Arrowroot exported from India, is produced in Travancore, and we have no information respecting the species which yields it, as *Curcuma angustifolia* has not been proved to be indigenous there. Some is also made in India from the tubers of *Ipomea Batatas.* In Europe Potato Starch is often substituted for Arrowroot. (*v.* AMYLUM.)

Action. Uses. Arrowroot participates in all the properties of Starch (*q. v.*), and is Nutritious and Demulcent. Well adapted for the diet of the sick, convalescents, and for infants when weaned. Used as a Demulcent in Urinary and Bowel complaints. Arrowroot makes a firmer jelly than most of the feculas, with the exception, perhaps, of that of Tous les Mois.

SCITAMINEÆ, *R. Brown.* Zingiberaceæ, *Lindl.*

The Scitamineæ, peculiar in habit, are most closely allied to Canneæ. They are remarkable for yielding a variety of spices, as Ginger, the various Cardamoms, and others now less known in Europe, as Zedoary, Zerumbet, Galangal; and they contain the Curcumas, which, besides Turmeric, &c., yield Starch, or Arrowroot.

ZINGIBER, L. E. D. Zingiber officinale, *Roscoe.* Rhizoma. *Ginger.* *Monandria Monog.* Linn.

Ginger, the ζιγγίβερις of Dioscorides, and the *Zinjàbil* of the Arabs, seems to derive its name from the Sanscrit Shringaveram. Pliny says

it was thought to be the root of Pepper, and called Zimpiperi,—"quanquam *sapori simile.*"

Rootstock biennial, creeping. Stem annual erect, 3 or 4 feet high, enclosed in the sheaths of distichous leaves. Leaves subsessile, linear-lanceolate, smooth. Spikes radical but elevated, oblong-obovate, strobiliform, formed of single-flowered, imbricated, acute bracts. Corolla with outer limb 3-parted, the interior unilabiate. Lip 3-lobed. Anthers double, crowned with a single incurved beak. Capsule 3-celled, 3-valved. Seeds many, arilled.—Cultivated in Asia and also in America.—Nees von E. t. 61.

Ginger is propagated by planting cuttings of the rootstocks of the plant. When the rhizome is young* it may be preserved in syrup, having been first scalded and scraped; it then forms the much-esteemed *Preserved Ginger.* In the autumn the rhizomes are taken up, and scalded in hot water, to stop the vegetative principle: they are then dried, without scraping, when they form what is called *Black Ginger*, or being scraped, they become *White Ginger.* But it is said that there are also differences in the plants; as there are in all which have been long cultivated. We require further information on the subject. Most of the *Black* or unscraped Ginger of commerce is brought from the East Indies, where it is cultivated both in the plains and mountains. The *White* Ginger comes principally from the West Indies, but some has lately been exported from Malabar. Much is further whitened by being bleached with Chloride of Lime, &c. Both kinds are remarkable for their warm and fiery, but grateful aromatic taste, and yield their principles both to water and to spirit. Ginger consists of Lignin, Starch, Gum, Bassorin, Acidulous Extractive, a yellow acrid Volatile Oil, and some soft, very acrid Resin.

Action. Uses. Grateful and Warm Aromatic. Rubefacient. Errhine, Sialagogue. Stimulant Stomachic, much used to give a tone to the Stomach, and in Flatulence. Used also as a condiment and as an addition to various officinal preparations, chiefly aromatic and purgative compounds. Besides the Syrup and Tincture, the effects may be obtained from its powder, in doses of gr. x.—℈j. or the Essence, which is a concentrated Tincture, or from Lozenges made with it.

TINCTURA ZINGIBERIS, L. E. D. Tincture of Ginger.

Prep. L. Macerate for 7 days *powdered Ginger* ℥ijß. in *Rectified Spirit* Oij. Strain.

E. Similar. Proceed as for Tinct. Cinchonæ.

D. Three times as strong.

Action. Uses. Warm Carminative Adjunct in doses of ♏x.—fℨi.

* The late Hon. F. Shore, when in the Deyra Doon, in conjunction with the Author, succeeded in making very good preserved Ginger, by taking up the rhizomes when very young, scalding them in hot water, and then preserving in Syrup. That prepared in India is usually very stringy. The Chinese Ginger, though in large pieces, is yet comparatively tender throughout.

SYRUPUS ZINGIBERIS, L. E. D. Syrup of Ginger.

Prep. L. Macerate *sliced Ginger* ℥ijß. in *boiling Aq.* Oj. for 4 hours. To the filtered liquor add *Sugar* ℔ijß. or q. s., and complete as for *Syr. Altheæ;* adding *Rect. Spirit* f℥ß., to each f℥j.

E. Similar, but no spirit.

D. *Tinct. Ginger* f℥j. to *Simp. Syrup* f℥vij.

Action. Uses. A pleasant adjunct to draughts, &c., in doses of f3ij.—f3iv.

CURCUMA, L. E. Rootstock of Curcuma longa, *Linn.* Turmeric.

Curcuma appears to be the κύπειρος Ἰνδικος of Dioscorides; but the name is no doubt derived from the Persian name *kurkoom.* Turmeric is extensively cultivated in almost every part of India, being employed as a condiment by the natives.

Rhizoma perennial, having many elongated ramifications, like it, yellow in colour; with numerous root-fibres proceeding from the rhizoma, many of which, as in the Maranta (*v.* p. 670), swell into white tubers. The leaves are all radical, bifarious, with long sheathing petioles, broad, lanceolar, of a uniform green. The scape rises from the midst of the leaves, is short, and formed into a spike by numerous imbricated and united bracts, in the lower only of which are from 3 to 5 flowers, supported by bracteoles. Corolla with a tube gradually enlarged upwards; limb double, each 3-parted. Anther double, incumbent, bicalcarate at the base. Style capillary. Capsule 3-celled. Seeds numerous, arillate.—Cultivated in India, China, and Java. Bot. Reg. t. 1825. Nees von E. 59 as *Amomum Curcuma.*

The ramifications of the rootstock form Turmeric, while Arrowroot is procured from the white tubers, as in Maranta, q. v. The Turmeric is sometimes divided into *round* and *long* kinds, but there are a great many varieties. Both *round* and *long* pieces are found on the same plant. The latter is most common, about the size of the little finger, curved, pointed, and marked externally with transverse annular wrinkles, of a yellow colour, but somewhat of a reddish-brown internally. The powder is of a bright yellow colour. The odour of Turmeric is peculiar, usually very conspicuous in Currie Powder. The taste is warm and bitterish, but spice-like. It contains a yellow Starch, a yellow Colouring matter, and an odorous acrid Volatile Oil (*Curcumin*).

Action. Uses. Turmeric is a mild aromatic, and much employed as a condiment. It is also used in dyeing. It is officinal chiefly for making Turmeric-paper, this being turned from yellow to a reddish brown by an alkali, and thus affording a ready method of detecting any alkaline excess.

CARDAMOMUM, L. E. D. Elettaria Cardamomum, *Maton.* Semen. The Seed. The Lesser or Officinal Cardamom. *Monand. Monog.* Linn.

Cardamoms were probably the καρδάμωμον of the Greeks, as they are produced in the same tract as Pepper, though it is difficult to prove the point. A great variety are known, and have been ably ex-

amined by Dr. Pereira in his Elements; but it is very difficult to refer them to their respective plants. The "Malaguetta pepper," or "Grains of Paradise," which are exported from Sierra Leone, and largely employed in England for the adulteration of beer, are produced mainly by *Amomum Granum Paradisi*, Afzel.; and various rare kinds of Cardamom, not employed in medicine, are supposed to be yielded by other species of the genus *Amomum*, which is closely allied to *Elettaria*.

There is no doubt, however, that the officinal Cardamom is produced in Wynaad and Coorg, on the Malabar coast, and by the plant so fully described and figured by Mr. White, and communicated by the Directors of the East India Company to the Linnean Society (v. Trans. x. p. 229), as well as by Dr. Roxburgh. (Fl. indica, ed. Wall. i. p. 68.) It was formed into a new genus, *Elettaria*, by Dr. Maton, where it is best retained until a re-examination of the family can be made by a competent botanist.

Fig. 93.

Rhizoma with numerous fleshy fibres. Stems from 6 to 9 feet high. Leaves lanceolate, acuminate, pubescent above, silky beneath. Scapes or flowering racemes from the base of the stem compoundly flexuose, procumbent. Outer limb of the corolla in three oblong lobes, inner a single lip. Anther of two distinct lobes. Filament with two transverse lobes at the base, emarginate, and simple at the summit. Capsule of 3 cells and 3 valves, with a central receptacle. Seeds rough tunicated.—Trans. Linn. Soc. x. t. 4 and 5. Nees von E. 66. St. and Ch. 106.

The Cardamom plant springs up spontaneously after the felling of large trees and the clearing away of the undergrowth. In the February (or April, *White*) of the fourth year, four or five flowering suckers are seen to spring from the stem near the root. The fruit of these is

ripe by the following November, when it is collected, and requires only drying in the sun.

Cardamoms in the capsule are from 4 to 7 lines long, from 3 to 4 thick, 3-sided, with rounded angles, obscurely pointed at both ends, longitudinally wrinkled, and of a yellowish-white colour. The seeds are small, angular, irregular, dotted on their surface, of a brown colour, easily reduced to powder. Varieties are distinguished by the names of Shorts, Short-longs, and Longs, probably all produced by the same plant. Mr. White describes the fruits as collected being separated into three or four sorts, head, middle, and abortive fruits. The odour of Cardamoms is fragrant, the taste warm, slightly pungent, and highly aromatic. These properties are extracted by water and Alcohol, but more readily by the latter. They depend on a Volatile Oil (about 4 per cent), which rises with water in distillation. The seeds also contain Fixed Oil 10·4. Alcohol extracts from them 12·5 per cent. of an acrid burning Resin and Extractive matter. The Lignin amounts to about 77 per cent.

TINCTURA CARDAMOMI, E. Tincture of Cardamoms.

Prep. Digest for 7 days *bruised Cardamoms* ℥ivß. in *Proof Spirit* Oij. Strain. Squeeze the residuum and filter the liquor. Or better, prepare by percolation, *v.* Tinct. Caps., first grinding the seeds in a coffee-mill.

TINCTURA CARDAMOMI COMPOSITA, L. E. D. Comp. Tincture of Cardamoms.

Prep. L. Macerate for 7 days *Cardamoms, Cochineal,* and *Caraways* āā bruised ʒijß., bruised *Cinnamon* ʒv., *Raisins* stoned ℥v., *Proof Spirit* Oij. Press and strain.

E. Similar. Or prepare by percolation, beating together the solid materials, and leaving them moistened with a little Spirit for 12 hours before they are put in the percolator. D. Similar; no Raisins.

Action. Uses. Aromatic adjuncts to draughts, &c. in doses of fʒj.—fʒij.

IRIDEÆ, *Juss.* Corn Flags.

The Irideæ are naturally allied to Orchideæ. They are found in temperate parts of the world. The rootstocks of different species of Iris have long been employed in medicine. *Iris florentina* yields Iris (orrice) root, which is collected chiefly near Florence and Leghorn, and being sent to other parts of the world, finds its way to India, where it is called *Bekh-bunufsha* (violet-root). It has a pleasant odour, resembling that of the violet, a bitterish acrid taste, and contains much fecula, with an acrid volatile oil. It is now used chiefly to impart an agreeable odour to the breath, and its powder in perfumery; much used by the French for making small round balls to keep open issues. The Costus of the ancients (*koot* and *puchuk* of the natives) is often called Orrice-root in North-west India. It is the root-stock of *Aucklandia Costus verus,* one of the Compositæ.

CROCUS, L. E. D. Crocus sativus, *Allioni.* The Stigma. Saffron. *Triandria Monog.* Linn.

Crocus is mentioned by Homer and Hippocrates: and as *Carcom* in the Old Testament. It is the *kurkoom* of the Persians and *zafran* of the Arabs.

Fig. 94.

The cormus (fig. 94) is roundish, and from its lower surface proceed numerous radicles. The leaves are 7 or 8 inches long, very narrow, traversed by a white midrib, and having long membranous sheaths at the base. They appear just as the flowers begin to fade. These are of a purplish colour, and make their appearance in autumn. They are axillary, with a 2-valved membranous spath, funnel-shaped, with a long tube and 6-parted limb, the throat bearded. Stamens 3, inserted into the tube. Anthers sagittate. Style filiform, with 3 long linear stigmas, wedge-shaped and notched at apex, drooping on one side, of a deep orange-colour. Capsule oval, acuminate, 3-celled, many-seeded. Seeds roundish. — Saffron was early cultivated in Egypt and Persia. The author obtained it from Cashmere. (*v.* Himal. Bot. p. 2.) It has long been introduced into Europe. Saffron Walden was so named from its being cultivated there.

The stigmata are the only officinal parts of the plant. These, with a portion of the style, are separated and carefully dried on paper by artificial heat. When dried, they form narrow shreds about an inch in length, of a brownish-red colour; and are called *Hay Saffron;* the produce of about 60,000 flowers is required to make up a pound. At other times the Saffron is pressed together, and forms what is called *Cake Saffron*, as is done with that of Persia, which is highly esteemed when imported into India: the Hay Saffron being the produce of Cashmere. But the Cake Saffron procurable in the shops here is made up of Safflower (*Carthamus Tinctorius*) and gum-water. (*Per.*) Saffron is now imported both from France and Spain, a little from other parts of Europe, and some from Bombay, which must be the produce of Cashmere or of Persia. Saffron must necessarily be dear, from the space and labour required to produce even a small quantity; and therefore it is frequently adulterated with Safflower, with Marygold, or occasionally with shreds of dried beef. Old Saffron is sometimes oiled to make it look fresh, or that from which the colour has been extracted is sold as good and fresh Saffron.

Saffron has a strong aromatic odour and warm bitter taste; is of a deep orange-colour, which it imparts readily to water or to Spirit; and tinges the saliva yellow when chewed. Analysed, it yielded of Volatile Oil 7·5, Gum 6·5, a yellow colouring matter (*Polychroite*) 65 per cent., the remainder consisting of Wax, Albumen, a little Saline matter, Lignin, and moisture. The properties depend on the Volatile Oil.

Action. Uses. Slightly Stimulant, and highly esteemed in Eastern countries, as it formerly was in Europe. Much used as an ingredient in the cookery of the East, and in that of the Continent; but is chiefly employed here as a colouring ingredient; though sometimes given in nervous affections, in doses of gr. x.—ʒß. It forms an ingredient of several officinal compounds, as Confectio Aromatica.

Syrupus Croci, L. E. D. Syrup of Saffron.

Prep. Macerate *Saffron* ʒv. in *boiling Aq.* Oj. in a covered vessel for 12 hours, then strain; add *Sugar* ℔iij., or q. s., and complete as with Syrup. Altheæ (using *Rect. Spirit*).
E. ʒx. to Oj. of water, &c.
D. ʒiv. No spirit in either.

Action. Uses. Useful as a colouring addition to draughts.

Tinctura Croci, E. D. Tincture of Saffron.

Prep. Digest *Saffron* chopped fine ʒij. in *Proof Spirit* Oij. Or prepare by percolation.
D. Twice as strong.

Action. Uses. Emmenagogue; used also as a Colouring ingredient.

Acoraceæ. (Tribe of *Aroideæ*, Endl.)

Many of the *Aroideæ* secrete Fecula, often united with acrid principle; but as the Starch may be separated by washing, as in the case of what is called Portland Sago or Arrowroot, yielded by *Arum maculatum,* so the rootstocks of several form articles of diet in different countries.

Acorus Calamus, *Linn.*, E. Rhizoma, or Rootstock of Common Sweet Flag. (Calamus aromaticus, E.)

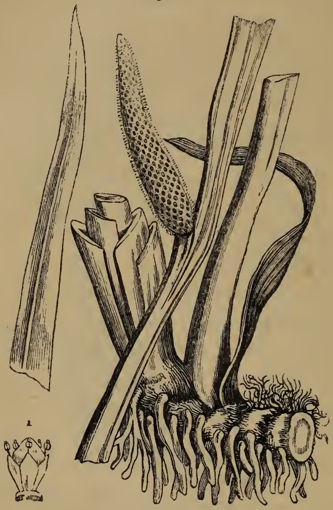
The ἄκορον of the Greeks, the *wuj* of the Arabs, and *buch* of the Hindoos. It has no claim to the name assigned it in the E. P.

Rhizoma thick, rather spongy, aromatic like every other part of the plant. Leaves erect, 2—3 feet high, about an inch broad, of a bright green colour. Stalk 2-edged or leaflike, but thicker below the spadix, which issues from one of the edges, about a foot above the root, 2 or 3 inches long, tapering, covered with numerous thickly set, pale-green flowers, characterised as in the family.—Native of Europe and of moist and cool parts of India, also of North America. —St. and Ch. 32. Nees von E. 24.

The rhizoma, or creeping procumbent stem, which throws up leaves from its upper and roots from its lower surface, is flattened, jointed, or marked with the semi-circular impressions of the leaves, of a light

brownish colour externally, with a reddish tinge in the inside. The odour is strong and aromatic, but not very agreeable; the taste warm, bitterish, aromatic, and a little acrid. It contains Volatile Oil, Resin, Extractive, Salts, woody fibre, and water.

Fig. 95.



Action. Uses. Aromatic Stimulant. The author has frequently prescribed it in conjunction with bitters, as the Chiretta and Bonduc Nut, and with success as an Antiperiodic in Agues. In powder in doses of gr. x.—℈j.; or in infusion (℥jß.–℥ij.—Oj. Aq.) in doses of f℥jß.

GRAMINEÆ, *Juss.* Grasses.

Grasses constitute the most important of vegetable families, being found in all parts of the world. Their herbaceous parts afford fodder for cattle, and secrete fecula in their seeds, which forms the chief food of mankind. Sugar is secreted by some, but especially by the Sugar-Cane, and a Volatile Oil by *Andropogon Calamus aromaticus*, Royle, and several other species. This oil, often called *Oil of Spikenard*, is extremely grateful for its fragrance, powerful as a stimulant, and especially useful as an embrocation, with one half or two thirds of Olive Oil, in rheumatism of the joints, &c. Silex is deposited on the surface of most grasses, as well as in the joints of the Bamboo, forming *Tabasheer.*

Tribe *Aveneæ.*

AVENA, L. E. D. Avena sativa, *Linn.* Semen tunicis nudátum, L. The Seeds, E. D. The Common Oat. Groats.

The Oat (*βρῶμος* of Dioscorides) was known to the Greeks.

The Oat is distinguished among cereal grains by its loose panicle. Spikelets 3—2-flowered. Florets smaller than the glumes, naked at the base, alternately awned. Outer palea with lateral nerves, awned, ending in two points. Awn dorsal, kneed and twisted. Stamens 3. Ovary hairy at the top. Stigmas 2. Scales 2. Grain long, crested, and furrowed. — A native probably of the Persian region. Several varieties are cultivated in Europe.—Nees von E. 28.

The grains of Oat when deprived of their integuments form *Groats;* these, when crushed, *Embden* and *Prepared Groats.* When the grain is kiln-dried, stripped of its husk and delicate outer skin, and then coarsely ground, it constitutes the *oatmeal* of Scotland. "The husk, with some adhering starch from the seed, is sold under the inconsistent name of *Seeds.*" (*c.*) Oats, according to Vogel, consists of 34 of husk and 66 per cent. of meal, and Oatmeal, in 100 parts, of 59 of Starch, 4·3 of Albuminous matter, Bitter Extractive and Sugar 8·25, Gum 2·5, with 23·95 of Lignin and moisture. Dr. Christison finds as much as 72 per cent. of Starch in Oatmeal. It consists therefore of nearly five-sixths of real nutriment.

Action. Uses. Groats and Oatmeal are nutrient and demulcent. When boiled with water (℥j. to Aq. Oj. boiled to Oß.) Gruel is formed, which is so useful as diet for the sick. Oatmeal, mixed to a thicker consistence, forms Porridge, and may be employed for making poultices.

Tribe *Hordeæ.*

HORDEUM, L. E. D. Hordeum distichon, *Linn.* Semen tunicis nudatum, L. (*Pearl Barley.*) The Decorticated Seeds, E. D. Common or Long-eared Barley. *Triandria Digynia,* Linn.

Barley formed one of the ancient articles of diet (Exod. ix. 31, v. Bibl. Cycl.). The Hebrew name *shoreh* is very similar to the Arabic *shair.* It is the *κρίθη* of Dioscorides.

Several species of Barley are cultivated. *H. vulgare* or Spring Barley, having its grains arranged in four rows, and *H. hexastichon,* or Winter Barley, having the same in 6 rows, and the officinal species, *H. distichon,* or Common Barley. Spikelets 3 together. Glumes 2, terminating in long awns, with 1 perfect flower, which is distichous, close pressed to the stem, awned, the lateral florets male, awnless, with the upper flower a subulate rudiment placed next the rachis. Paleæ 2, the inferior one ending in an awn. Stamens 3. Ovary hairy at the apex. Segments 2, feathery. Scales 2. Grain oblong internally, with a longitudinal furrow, adherent to the ovary. — Probably a native of Tartary. (Reideul.)

The grains of Barley, deprived of their husks, which according to Einhof amount to 18·75 per cent., form the *Hulled* or *Scotch Barley,*

and when ground, *Barley Meal*. When the process of decortication is carried further, and the grains become rounded or ovoid, but still retain the mark of the longitudinal furrow, they form the officinal article, *Pearl Barley*. This ground to powder, forms *Patent Barley*. (*p.*) It abounds in Starch, with a little Gluten, Sugar, and Gum. According to the analysis of Einhoff, Barley consists of Meal 70·05, Water 11·20, and of Husk 18·75 in 100 parts, while the Meal consists of 67·18 of Starch, 5·21 of uncrystallizable Sugar, 4·62 of Gum, 3·52 of Gluten, 1·15 of Albumen, 6·24 of Phosphate of Lime, and 7·29 of Vegetable fibre, the remainder being water and loss. When Barley is malted, Sugar and Dextrine are produced at the expense of the Starch.

DECOCTUM HORDEI, L. D. Barley Water.

Prep. L. Take *Barley* ℥ijß., wash off extraneous matters with water, pour on it *Aq.* Oß. and slightly boil; throw this water away, pour on it boiling *Aq.* Oiijß. and boil down to Oij. Strain.
D. Similar.

Action. Uses. Mucilaginous Demulcent, containing the soluble parts of the Barley.

Mucilago Hordei, D., resembles the above, but is made with *ground barley*.

DECOCTUM HORDEI COMPOSITUM, L. Mistura Hordei, E. Compound Decoction of Barley, or Barley Mixture.

Prep. L. Take *Decoction of Barley* Oij., stoned *Raisins, Figs* sliced āā ℥ijß., *fresh Liquorice Root* bruised ʒv., *Aq.* Oj. Boil down to Oij. and strain.
E. Similar.

Action. Uses. Demulcent, and useful as a pleasant diet drink.

SECALE CEREALE, *Linn.*, or Common Rye, is officinal when in a diseased state, forming *Secale cornutum*, Spurred Rye, or Ergot, ERGOTA, L. E. D.; but as the properties of this substance seem to depend on the presence of a fungus, it is preferable to treat of it with the Fungi. The Rye cultivated in Europe is considered to be a native of the Caucasico-Caspian Desert; Dr. Falconer met with it in Thibet and Toorkistan, where it is called *Deo gundum*, or Devil's Wheat. The meaning of *Kussemeth*, translated Rye and Fitches in our Bible, is uncertain.

TRITICUM VULGARE, L. E. Triticum æstivum, D. Wheat.

Wheat is very similar in sound to the Hebrew *khittah*, Arabic *hinteh*, and there is no doubt it was cultivated by and formed the food of the earliest civilized nations. It is the *πύροι* of the Greeks.

T. vulgare, var. *hybernum*, the kind most commonly cultivated, is sown in Autumn and reaped in the following summer. Spike four-cornered, imbricated,

with a tough articulated rachis. Spikelets solitary, generally 4-flowered. Flowers distichous. Glumes 2, nearly opposite, equal, the upper one bicarinate; the keels more or less aculeate, ciliate, ventricose, ovate, truncate, mucronate, compressed below the apex, round and convex at the back, with a prominent nerve, awned or awnless. Stamens 3. Ovary pyriform, hairy at the apex. Stigmata 2, feathery. Scales 2. Grain loose, externally convex and internally marked with a deep furrow.—Cultivated everywhere; said to be a native of Tartary.

Besides this, *T. vulgare,* var. *æstivum,* or Spring Wheat, is cultivated. *T. compositum* or Egyptian Wheat is distinguished by its compound spikes. *T. Spelta,* Bere or Spelt, much cultivated in France, and *T. monococcum,* remarkable for having only a single row of grains, may also be mentioned.

The grain of Wheat differs from that of both Barley and Oats in not adhering to its perianth, so that this is easily separated in the process of thrashing. It is reduced into Flour, *Fărina*, by grinding. The *Bran*, which consists from 25 to 32 per cent., according to the variety of wheat, is separated by sifting.

Farina, L. E. D. Triticum vulgare. Farina Seminis. Flour.

Flour, according to the analysis of Vauquelin, consists of Starch 68·08, Gluten 10·80, Sugar 5·61, Gum 4·11, Water 10·25; but the proportion of these constituents necessarily varies. The ashes of Wheat, which amount only to 0·15 per cent., consist, according to Henry, chiefly of the Biphosphates of Soda, Lime, and Magnesia.

Flour, though officinal, is seldom applied to any medicinal purpose. Its nutritious properties, and its superiority to all other meals for making bread, are well known. Both are dependent on the presence of so large a proportion of *Gluten*, which was at one time thought to be a simple substance, but is now known to be compound (containing *Albumen*, *Vegetable Fibrine*, *Glutine*, and *Caseine*). The Starch and Gluten may easily be separated by kneading Wheat Flour in water, when the particles of Starch are washed out, suspended, and afterwards deposited, in the same way as Sago, Arrowroot, and Tapioca. There remains behind a greyish-white adhesive mass, which is also ductile and elastic. This is Gluten. Its properties are fully described in chemical works. It consists of the 4 substances above-mentioned; all of which are compounds of Proteine, and contain Nitrogen. Owing to the presence of this Gluten, the paste made with Wheat Flour is very tenacious, and bread made with it is light, porous, and well raised.

Panis, Bread made from Wheaten Flour, is officinal in the L. P. It is used in making pills, &c.

Amylum, L. E. D. Triticum vulgare. Seminis Fæcula, L. Fecula of the Seeds, E. D. Starch.

Starch may be procured by the above process; but it is obtained on a large scale by steeping the Wheat Flour for some time in water, when Sugar, Gum, and Salts are dissolved, and the liquor becomes

sour from the production of Lactic Acid. The Gluten, which adheres to the Starch with great tenacity, is then in a great measure dissolved by the acid, and the Starch more easily separated. When the Starch has been separated, it is allowed to drain, and then subjected to pressure. In drying it assumes the form of irregular prisms, so characteristic of manufactured Starch. It has of late been obtained of fine quality from Rice, by the action on it of a weak solution of Caustic Soda. Good Wheat Starch is white, without odour or taste, and appears a soft homogeneous powder. But, when examined under the microscope, it is found to be composed of granules which are unequal in size, each displaying a series of concentric rings, surrounding a central point which has been named the hilum. These Starch granules consist of small cells having a diaphanous wall, which enclose the true Starch, or *Amidine* ($C_{12}H_{10}O_{10}$). Starch globules are insoluble in cold water, but boiling water bursts the membranous tegument, and then the Amidine is dissolved. If the quantity be sufficient, a gelatinous mass is produced on cooling. If brought when cold into contact with free Iodine, a deep blue colour (*v.* p. 45) is produced. This colour is destroyed by heat. Starch is insoluble in Alcohol, also in Ether, as well as in Fixed and Volatile Oils. By the action of Dil. Sul′ Starch is converted into Sugar, and by Nit′ into Oxalic Acid. In the process of germination, and in that of malting, it is likewise converted into Sugar by the action of a principle called Diastase. The composition of Starch, from whatever plant derived, is $C_{12}H_{10}O_{10}$.

The starchy farina, flour, or meal, of many seeds, roots, and other parts of plants, is used for nutritive purposes in various parts of the world. Such a specimen of flour, when examined under the microscope, is seen to consist partly of an amorphous material, and partly of minute grains of starch of a definite shape. The amorphous part consists mainly of gluten, from which the pure fecula is frequently separated artificially, and prepared in the various forms of Starch, Arrowroot, Sago, &c. In many cases these grains of Starch are so peculiar in shape that by a microscopic inspection the source from whence they have been obtained may at once be determined. This subject was first investigated by M. Raspail, but some of his descriptions are inaccurate. He was succeeded by M. Payen, the author of an elaborate and well-illustrated memoir; and a number of very exact descriptions have been since given by Dr. Pereira. The following is a brief analytical outline of the microscopic characters of the chief varieties of Starch met with in commerce. Most of these are peculiar, and may be recognized with equal facility, whether the specimen under examination be a pure fecula, or a finely-ground meal or flour, containing also gluten. But the first four Cereal Starches, though easily distinguished from all others, are not so readily recognized individually. Most of the measurements are those of Mr. G. Jackson.

A. *Starch-grains more or less circular in shape.*

1. *Of two distinct sizes.*

Wheat Starch. Grains circular; strongly shaded with concentric rings, surrounding a central hilum. Some large, others much smaller, with but few of an intermediate size. Small grains globular, large ones flattened. Size across, from 1 to 9-10,000ths of an inch.

Barley Starch. In barley-meal, &c. Similar to last; but with the grains more irregular in shape; more of the intermediate size; and less shaded with rings.

Oat Starch. In Oatmeal and Groats. Same size as last two; some large and some small; grains much more irregular, being polyhedral by compression; no rings seen at all.

Rye Starch. Grains varying in size in the same way, but growing larger; largest ones measuring as much as 16-10,000ths; with scarce any shading, but peculiar in having a large well-marked stellate hilum in the centre.

Fig. 96.*

Fig. 97.†

Fig. 98.‡

2. *Nearly uniform in size.*

Tacca Starch. Tahiti Arrowroot is prepared from the tubers of *T. oceanica.* Grains circular, with a central hilum; or mullar-shaped, (*i.e.* abruptly cut off at one end), with the truncate end hollowed out. Average diameter 8-10,000ths.

Maize Starch. In Maize meal, or Polenta. Of an average size, measuring from 5—7-10,000th of an inch. Irregular, angular, often with projections; and with a marked central hilum, but no rings.

Arum Starch. Portland Arrowroot is made from the root of *Arum maculatum.* Grains very small; diameter 1—4-10,000ths. Usually circular, with a central round depressed hilum.

Rice Starch. Grains still smaller, from 1—2½-10,000ths in diameter. They seem uniformly opaque, and are many-sided—usually hexagonal.

Fig. 99.§

Fig. 100.‖

B. *Grains more or less oblong or oval.*

1. *Convex and shaded.*

Canna Starch. The fecula called Tous-les-Mois is obtained in the West Indies from the tubers of *C. coccinea* and *C. edulis.* Grains very large, ovoid,

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* Grains of Wheat Starch; *a*, a particle seen sideways.
† Grains of Tahiti Arrowroot, or Otaheite Salep.
‡ Grains of Portland Arrowroot.
§ Tous les Mois or Canna Starch. ‖ Potato Starch.

regular in shape; length, from 25—40-10,000ths of an inch. Stellate hilum and concentric rings very distinct.

Potato Starch. Sold as English Arrowroot. Grains large and convex; smaller ones circular; larger ones oblong, ovate, or irregular and angular. Hilum near one end, rings well marked; sometimes 2 or more hila, each with a system of rings round it. Length, 2—23-10,000ths.

Sago Starch. In Sago-meal and Pearl Sago. Grains large, convex, ovoid, length from 8—20-10,000ths. Some contracted at one end, or mullar-shaped. Hilum near one end; rings distinct. Grains generally more or less broken.

Maranta Starch. West Indian Arrowroot is obtained from the tubers of *M. arundinacea.* Grains convex, moderately uniform in size, rather irregular in shape; generally oblong; length 5—20-10,000ths. Rings well marked; hilum at one end, stellate.

Tapioca Starch. In Tapioca (*q. v.*), Brazilian Arrowroot, and Cassava-meal. Grains convex, ovoid, or mullar-shaped, the truncated end often having several facets; concentric rings, and stellate hilum near one end; length 2—10-10,000ths.

Fig. 101.*

Fig. 102.†

2. *Flat and transparent.*

Curcuma Starch. East Indian Arrowroot is yielded by *C. angustifolia*, *C. leucorrhiza*, and other species. Grains peculiar in being flat, transparent, ovate disks, which sometimes show their edges. The narrow extremity, bearing the hilum, often projects like a nipple. Rings very fine. Length 12—24-10,000ths.

Plantain Starch. (see below.) Prepared in Guiana from the unripe fruit of *Musa paradisiaca.* The grains are described as flat and transparent, like Curcuma starch, and ovoid, with the hilum at the narrow end.

Fig. 103.‡

Fig. 104.§

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* Grains of Sago Meal. † Grains of West Indian Arrowroot.

‡ Entire grains of Tapioca.

§ Grains of East Indian Arrowroot. These drawings, which are all made to one scale, are copied from those in Dr. Pereira's Treatise on Food and Diet. They represent with tolerable accuracy the microscopic appearance of some of the Starches described; though the grains of Curcuma Starch are somewhat flatter than is here shown, and should be less strongly shaded. For an account of the structure and formation of the starch-grain, see Payen's Memoir in the *Annales des Sciences Nat.*, vol. x., and a late paper by Mr. Busk in the *Microscopical Journal.*

The following farinæ and feculæ, sent from India to the Great Exhibition, have been lately examined by Mr. F. W. Headland. No precise measurements have yet been made of the sizes of the starch grains.

Plantain Meal, from Madras. Grains transparent, like those of Curcuma Starch, but not so thin. They vary in length from 3- to about 30-10,000ths of an inch. Often irregular in shape, but generally oval, some being long, narrow, curved, and cucumber-like, by which this starch may be readily distinguished. The rings are fine, but very distinct; the hilum small.

Phœnix Sago Meal, from Cuttack. Probably from the trunk of some species of *Phœnix.* Grains large and solid; shape circular, pyriform, or oval; hilum very marked, placed near the centre, sometimes linear, but usually stellate, cracked and fissured. Length about 15—20-10,000ths.

Trapa Starch. From seeds of *Trapa bispinosa,* Bengal. Grains oval or triangular in shape; often irregular and tuberculate, like Maranta Starch; having a central hilum. Length about 10-10,000ths.

Unknown fecula from Rutnagherry (Bombay). Grains small, solid, mostly circular, some few mullar-shaped, with a depressed hilum in the centre. Average diameter 410,000-ths. Very similar to Arum Starch, and possibly derived from some Aroideous plant.

Nelumbium Starch. From seed of *Nelumbium speciosum,* Cuttack. Grains very small, tolerably uniform in size, and oval in shape. Length from 1—3-10,000ths.

Specimens of *Arrowroot* (one of them, from Rutnagherry, stated to be the produce of the *Kutchoora* plant) and of the starch of *Curcuma leucorrhiza,* from Bengal, had both of them the characters of Curcuma Starch, as given above.

Action. Uses. Starch is Nutritious and Demulcent, extensively employed as an article of diet, and for the sick, in the form of Sago, Arrowroot, and Tapioca. As hair-powder, it is employed for powdering the irritated skin.

Pharm. Prep. Trochisci Acaciæ, E. Pulvis Tragacanthæ comp., L. E.

DECOCTUM AMYLI, L. Mucilago Amyli, E. D. Mucilage of Starch.

Prep. L. E. Rub up *Starch* ℥iv. with *Aq.* Oj. Boil.
D. Twice as much starch.

Action. Uses. Demulcent. Useful in Dysenteric and Urinary Complaints as an injection; and also for suspending powders.

Other Grasses abound in Fecula and afford nutritious diet. Rice, *Oryza sativa*, contains at least 89 per cent. of Starch (Payen), about 7 Gluten, and a little Gum, Sugar, Oil, Water, Lignine, and Phosphate of Lime. It forms a good substitute for Potatoes, &c.; if carefully boiled and steamed, the grains remain soft and separate, instead of forming a pulpy mass. Maize or Indian Corn, *Zea Mays*, which, like Rice, forms the chief food of millions, and is highly esteemed by the Americans, is nutritious, containing Starch 67 per cent., Gluten 12, a little Sugar, Gum, Oil, and Salts. The flour is sold by the name Polenta. Coarsely ground it makes excellent Gruel, and may be used for Poultices. *Sorghum vulgare*, the *joar* of India, *durra* of the Arabs, is well suited to the same purposes, as are also many of the smaller grains, especially of the Tribe *Paniceæ.*

Tribe *Saccharineæ.*

SACCHARUM, L. E. D. Saccharum officinarum, *Linn.* Caulis succus præparatus, purificatus, crystallinus, L. Saccharum purum, E. Refined Sugar, D. White Sugar.

SACCHARUM COMMUNE, E. D. Brown Sugar.

SACCHARI FÆX, L. E. Succus præparatus, impurus. Treacle.

Sugar is a principle very generally diffused in the vegetable kingdom. In the East and West Indies it is obtained chiefly from the Sugar Cane, but in the East also from Palms; in France, from the Beet-root and Mangel-wurzel; in America, from the Maple; and it is also found in many fruits, roots, &c. It is probable that it was first discovered by evaporating the juice of Palms in India, of which the Sugar is called *jaggarg.* But the Sugar of the Cane has been known both in India and Egypt from very early times, and the ancients were acquainted with it. (v. Essay on the Antiq. of Hindoo Med. p. 83.)

The Sugar Cane grows from 6 to 12 feet high, with a jointed stem, hard and dense externally, but juicy in the inside. Leaves long, linear, strap-shaped, enveloping the stem with their sheaths. Panicles 1 to 3 feet long, elegantly diffuse and waving, silvery from the quantity of long hairs attached to each floret. Spikelets all fertile, in pairs, the one sessile, the other stalked, articulated at the base, 2-flowered, the lower floret neuter, with one palea, the upper hermaphrodite, with 2 paleæ. Glumes 2, membranous, obscurely 1-nerved, with very long hairs on the back. Paleæ transparent, awnless, those of the hermaphrodite flowers minute, unequal. Stamens 3. Ovary smooth. Styles 2, long. Stigmas feathered. Scales 2, obscurely 2- or 3-lobed at the point, distinct. Grain little known. A native probably of India, the Indian Islands, or of China.—Nees von E. 33. 34, 35. St. and Ch. 148.

The Sugar Cane is cultivated from cuttings, and takes about a year to come to maturity. It is then cut down close to the earth, topped, stripped of its leaves, and crushed between iron rollers, or in a wooden mill. The juice is first mixed with Lime to saturate the acid which is present, and then heated. The clear liquor is separated and evaporated till it becomes granular. It is then put into casks; the uncrystallizable parts (the *Molasses* or *Treacle*) allowed to drain off, and the Sugar left in the state of the Raw or Muscovado Sugar of commerce. The quantity of this is diminished, and that of the Sugar increased, by employing a less degree of heat and by boiling in vacuo. It undergoes purification in various ways, by solution in water, refining with albuminous matter, filtration through a stratum of animal charcoal, evaporation, and recrystallization, and by passing pure syrup through it. When white and pure, it forms refined, or loaf Sugar.

Cane Sugar ($C_{12}H_{11}O_{11}$, when in crystals,—$C_{12}H_9O_9$, when in combination), allowed to crystallize slowly from its solution, forms large crystals of hydrated Sugar, or Sugar Candy, in oblique rhombic prisms. Sugar is well known for its pure and sweet taste. Sp. Gr. 1·6. It is white, and without odour, soluble in water, forming

Syrup, less freely so in Alcohol. It is unchanged in the air, but when heated melts, and again solidifies on cooling in the form of glassy clear *Barley Sugar.* When heated to a greater degree, it becomes decomposed, swells, emits a peculiar odour, becomes of a deep-brown colour, and is called Burnt Sugar or *Caramel*, which is much used for colouring Spirits. It burns away at a higher heat. Sugar combines with the alkalis: and after a time the alkaline reaction disappears, and an acid (the Glucic) is formed. It also unites with some metallic oxides, as that of Lead. When pure, no precipitate takes place with Diacetate of Lead. It prevents both the Iodide and Carbonate of Iron from being readily decomposed, and it renders the fixed and volatile oils to a certain extent miscible with water. Nit′ converts it into Oxalic acid. Sul′ chars it; but when long boiled with diluted Sul′ it is converted into Grape Sugar. A weak watery solution exposed with yeast to a temperature between 50° and 80°, undergoes fermentation.

Grape Sugar ($C_{12}H_{12}O_{12}$,+2HO, when crystallized), Sugar of Fruits, or *Glucose*, is found in the Grape and in other fruits, and differs in several particulars from Cane Sugar, besides in containing more Oxygen and Hydrogen. It is less sweet, less soluble in water, crystallizes in warty granular masses, and combines with difficulty with Lime, Baryta, and Oxide of Lead. Its solution becomes brown when heated with caustic Potash, which does not colour Cane Sugar. It dissolves in Sulph. acid without blackening.

Action. Uses. Dietetic, Nutrient, Demulcent. Sugar is much used to cover the taste of medicines; also in Syrups, Conserves, Confections, Electuaries, and Lozenges; and to suspend oily in aqueous liquids. Treacle, remaining soft, is well adapted for making pills.

SYRUPUS, L. Syrupus Simplex, E. D. Syrup.

Prep. L. Dissolve *Sugar* ℔iij. in *Dist. Water* Oj. with a gentle heat.
E. ℔x. to Oiij.
D. ℔v. to Oij.

Action. Uses. Syrup is applied to all the pharmaceutical uses of Sugar. It is preserved at a temperature of 50°. It sometimes requires to be purified by boiling with the white of egg.

The *Cyperaceæ* may be called the grasses of moist situations, and they very closely resemble them in appearance; but they may readily be distinguished by their stems being solid, often triangular, and their leaves with entire, not split sheaths. They are much less useful than the plants of that family. The famed Papyrus belongs to the Cyperaceæ. A few secrete fecula in their tuberous rootstocks, as the Water Chesnut of the Chinese; others secrete a little Volatile Oil, as *Cyperus longus* and *rotundus.* The creeping rhizomas of *Carex arenaria*, and of a few allied species, are sometimes used medicinally, under the name of German Sarsaparilla.

Class III. ACOTYLEDONES, *vel* CRYPTOGAMÆ.

Sub-Class I. Acrogenæ.

Filices, *Juss.* Ferns.

The rhizomes of many Ferns are astringent, some contain a volatile oil, and some an acrid principle. The fronds are mucilaginous when young, and are used as food in some countries.

Filix, E. Rhizoma of Lastrea Filix Mas, *Presl.* referred to Aspidium, by *Smith*, &c. to Nephrodium by *Richard*. Male Shield Fern. *Fern Root.*

This is supposed to have been the πτέρες of Dioscorides. Several Ferns were no doubt employed medicinally by the ancients.

The Rhizoma horizontal, thick, with numerous tufts (the bases of the fronds) ranged along the common axis, separated from one another by brownish-yellow silky scales. The true roots emerge from between these tubercles, and descend downwards. The fronds or leaves ascend upwards in tufts 1 to 4 feet high. Fronds bipinnate, rising in a circle from the tufted rhizoma; pinnules obtuse and serrated, only slightly narrowed downwards, and the lowest leaflet of considerable size, lobes usually a little combined at the base. Veins distinct, after leaving the midrib, not uniting with those of the adjoining pinnule. Stipes, or footstalk and midrib, either glabrous, yellow, or densely clothed with purple scales. Sori roundish, scattered, covered by an indusium, which is reniform, attached by the sinus. Sori placed in two rows near the central nerve, and below its lower half.—Indigenous in woods, but found in other parts of Europe, &c.—Nees von E. 27.*

The Rhizoma, according to M. Peschier, of Geneva, should be collected in summer. M. Geiger directs that the inner parts of the fresh root-stock, and of the portions of leaf-stalk attached to it, which are fleshy and of a light greenish colour, should alone be preserved; the black and discoloured parts with the fibres and scales should be separated, and the other parts carefully dried, powdered, kept in small well-stopped bottles, and renewed annually. The powder should be of a light greenish-yellow colour, of rather a disagreeable odour, a bitter and astringent taste. Analysed by Geiger, it was found to contain of a Fatty Oil 6·9, Resin, 4·1. with Tannin, Starch, Gum, and Uncrystallizable Sugar. Morin of Rouen discovered a Volatile Oil. M. Peschier of Geneva found its active principle to be soluble in Ether.

Action. Uses. Anthelmintic: has been so used from early times; formed the basis of Madame Nouffer's remedy for expelling tapeworms. Dr. Peschier, a brother of the above, Brera, and Ebers, have all borne testimony to its efficacy, in the form of the Ethereal Extract,

* The rhizoma of the *Aspidium Athamanticum*, Kunze, which grows near Port Natal, is stated by Dr. Pappe to be in high esteem among the Zoolu Caffres as a vermifuge, especially for Tapeworm. It is called *Uncomocomo.*

of which from 12 to 24 grs. form a dose (at night and again in the morning), or from 1 to 3 drachms of the powder. A decoction (℥j.—Aq. Oj.) has also been employed in divided doses. A dose of Castor Oil is exhibited after the second dose of the Ethereal Extract in cases of Tape-worm, it being found most useful for that kind which is more common on the Continent, the *Bothriocephalus latus.*

Sub-Class II. Thallogenæ.

Lichenes, *Juss.* Lichens.

They crawl upon the earth, or on rocks, or on the bark of trees, sometimes burrowing into their substance. Some are mucilaginous and nutritious, others bitter and astringent, and a few remarkable for yielding colouring matter.

Cetraria, L. E. D. Cetraria Islandica, *Achar.* (*Lichen islandicus,* Linn.) *Iceland Lichen* or *Moss.*

This Lichen was first employed by the natives of Iceland.

Plant erect, 2 to 4 inches high, formed of a dry, leathery, smooth, laciniated, foliaceous thallus, the lobes of which are irregularly subdivided, channelled, and fringed at their edges. Those divisions upon which the reproductive matter is produced are more dilated, smooth, of a light brownish colour, paler on the under surface, rather reddish towards the base. The fructifications or *apotheciæ* are shield-like, or like shallow saucers, with a harder elevated rim, of a deeper brown colour, and project from the surface of the thallus near its border. — Mountains of both the Old and New World. — Nees von E. 10. St. and Ch. 69.

This Lichen, in its dried state, varies in colour from greyish-white to reddish-brown, is without smell, but has a mucilaginous bitter taste. When moist, it is a little leathery, but when dry, may be powdered. Cold water takes up only a small portion, but boiling water about 65 per cent. of its substance, forming a slimy and nearly colourless liquid, which, if the decoction be strong, forms a jelly on cooling. Alcohol dissolves the bitter principle, which is an acid, called *Cetraric,*′ almost insoluble in water, slightly soluble in alcohol and ether. It has been obtained in white crystals, which are extremely bitter, and have been used as a substitute for Cinchona. Alkalis readily combine with it, and form soluble compounds, and this affords the best method of freeing this and other similar Lichens from their bitter principle; as by macerating them in 24 times their weight of a solution formed of 1 part of an alkaline carbonate and 375 parts of water. The inhabitants of Iceland and Lapland, however, free it of the bitter principle by repeated maceration, and then make use of it as an article of diet, either made into bread, or boiled with milk. They find it nutritious, from the principle called *Lichenin,* or Lichen-Starch. This does not dissolve, but swells up in cold water; the solution is not affected, although its jelly is rendered blue by Iodine. It may be converted into Grape-Sugar by dil. Sul′, and most nearly resembles the jelly of the sea-weeds.

Iceland moss also contains *Inuline*, another starch-like body. These two starchy matters form about 80 per cent., and the Cetraric acid 3 per cent.

DECOCTUM CETRARIÆ, L. Dec. Lichenis Islandici, D. Decoction of Iceland Lichen.

Prep. Take *Cetraria* ʒv., *boiling Aq.* Ojß. Boil down to Oj. and strain. D. ℥j. in the same quantity.

Action. Uses. Demulcent: Tonic; for cases where more stimulant remedies are unsuitable, as Phthisis and other chronic Pulmonary affections, in doses of f℥jß.—f℥iij. every 3 or 4 hours.

LACMUS, L. E. D. Litmus. A peculiar Colouring Matter from Roccella tinctoria, *Achar.* Dyers' Orchil or Weed.

Orchil (written also Archil) is the name of a dye, as well as of the plant yielding it. But several distinct plants are employed for the same purpose, distinguished by different names according to the country from whence they are imported. They are divided by manufacturers into *weed* and *moss*, the former term being applied to the filiform Lichens of botanists, belonging to the genus *Roccella*, while the term *Moss* and *Rock Moss* is applied to the crustaceous Lichens belonging to the genus *Lecanora* and others like it.

The most valuable of these dye-lichens is imported from the Canaries, and consists of *Roccella tinctoria;* but some *R. fuciformis* is also imported under the name of Madeira Weed. It is doubtful, however, whether either of these is always employed in the preparation of *Litmus*, as this is said to be prepared from *Lecanora Parella* and *tartarea;* the first called by the French *Parelle d'Auvergne;* the latter the *Cudbear* of English commerce. Guibourt states that the colour of Litmus is given by *Crozophora tinctoria*, or Turnsole, one of the Euphorbiaceæ. Dr. Pereira has proved that the Litmus of commerce always contains Indigo. The blue colour, however, is formed out of the lichens themselves, a red colouring matter being first developed by the action of ammoniacal salts (as from putrid animal matters), and this being changed into a blue by the addition of Potash or Soda. Dr. Müller (P. J. xij. 255) states that all kinds of lichens are used in the production of Litmus; that the best qualities made in Holland are prepared from *Roccella tinctoria;* but inferior sorts from species of *Variolaria*, *Lecanora*, and *Parmelia.* These are ground, and placed in contact with nitrogenous matters, as urine, at a certain heat. A red colouring matter forms first. Potash is then added, and powdered Carrara marble mixed in.

Uses. Litmus is officinal only as a test for ascertaining the presence or excess of acids and alkalis; blue Litmus-paper being changed to a red by acids, and reddened Litmus having its colour restored by alkalis.

ALGÆ, *Juss.* Sea Weeds.

Many Algæ abound in gelatinous matter, as the Ceylon Moss prepared by Mr. Previté, respecting which several favourable testimonies have been given, and which is stated to contain from 54 to 63 per cent. of jelly. This appears to be, as stated by Dr. Lindley, a species of *Gracillaria*, as the edible Birds'-nests are composed of one collected by swallows. A *Gelidia* from Ceylon, is noted in Rottler's Herbarium as yielding jelly; so *Chondrus crispus*, or the Carrageen Moss of Ireland, has been introduced as a Nutrient and Demulcent, and used both in the form of Decoction and of Jelly. *Gigartina Helminthocorton*, or Corsican Moss, is officinal on the Continent as an Anthelmintic. It probably acts, like Cowhage, as a mechanical irritant, from the fragments of numerous corallines mixed with it. (*v.* Fee and Merat and De Lens.) Some species of *Porphyra* and *Ulva* yield the Laver, which is used as an article of diet, as Laminaria is in Lapland. Some Sea-weeds are employed as manure for land. Some are burnt for Kelp (*v.* p. 100), or impure Carbonate of Soda, which is now chiefly valuable on account of the Iodine it yields (*v.* p. 44), on which account seemingly a Laminaria, from the China or Caspian Seas, or from the Persian Gulf, finds its way to the foot of the Himalayas, where it is employed as a cure for Goitre. (*v.* p. 44.)

The ashes of the *Fucus vesiculosus*, or common Bladder-wrack, form a popular cure for Goitre on the sea-coast of England. They contain Iodine.

FUNGI, *Juss.* Mushrooms.

Fungi generally abound in moist situations, are generated on leaves and stems, are sometimes subterranean, but are most frequently found on organized bodies in a state of decomposition. A few of them are edible, as the common Mushroom (*Agaricus campestris*), and Truffle (*Tuber cibarium*), but all are suspicious. *Ammanita muscaria* is remarkable for its intoxicating properties: many are poisonous. The Agarics of the old Materia Medica are now referred to the genus *Polyporus*, and *Amadou*, used as tinder, is made from *P. igniarius*. They are remarkable among plants for consuming much Oxygen, and giving out Hydrogen and Carbonic acid gas. Analysed by Vauquelin and Braconnot, they have been found to contain some peculiar principles, as Fungin and Boletic and Fungic acids. They are very destructive to plants and property in the forms of Mildew, &c. and of Dry Rot, and of late, if not caused, they have at least greatly accelerated the destruction of the Potato crop.

ERGOTA, L. E. D. Secale cereale, *Linn.* Semen fungo parasitico corruptum (?), L. An excrescence supposed to be caused by a parasitical fungus, D. Ergot of Rye.

Ergot seems to have been first used as a medicine by the profession in France and the United States towards the end of the 18th and the beginning of the present century, but in this country not before the year 1824. Its effects seem to have been long popularly known in Germany, and pestilential diseases in early times have been ascribed to eating ergotized grain as food. (*v.* Burnett's Outlines of Botany, p. 207.) Various opinions have been entertained respecting the nature of Ergot, some considering the whole Ergot as a Fungus, which has been named *Spermoedia Clavus* by Fries, and is supposed to take the place of the natural grain. Others consider that the grain of Rye is simply diseased, from ordinary causes. But the opinion

which has always appeared to the author as the most satisfactory, is that which considers the Ergot as the grain of Rye stimulated into diseased action by the presence of the spores or sporidia of a parasitical Fungus. This opinion, promulgated by Leveillé (*v.* Merat and De Lens), has been fully confirmed by others, more recently by Mr. Edwin Quekett, who has shown that the Ergot is the altered grain, from its articulation to the receptacle, the scales at its base, the hairy crown of the grain, and frequent remains of the stigma on its top. Some beautiful drawings, now in the British Museum, have been made of it in its different states by Mr. Bauer (*v.* Trans. Linn. Soc. vol. xviii., and the Penny Magazine, where some of them have been published). The first appearance of the Fungus, which Mr. Quekett named *Ergotætia abortifaciens*, is indicated by the young grain and its appendages becoming covered with a white coating, which is formed by a multitude of sporidia mixed with cobweb-like filaments. A sweet fluid, which by degrees becomes viscid, and is found to contain the sporidia, oozes from the Ergot or parts around it. When half-grown, it shows itself above the floral envelopes, and is of a dark purplish colour: the production of sporidia then nearly ceases, and the upper part of the grain is observed to be of an undulated vermiform appearance, which Leveillé considered to be the single Fungus, and calls *Sphacelia segetum*, but which, as ascertained by Mr. Quekett, consists of myriads of sporidia. The Ergot, come to its full size, is of a violet-black colour, and projects much above the paleæ. Many other Grasses and some Cyperaceæ are liable to be affected by Ergot, which is most prevalent in damp situations and in moist seasons. *v.* Linn. Trans. vol. xviii. t. 32, 33.

The Sporidia are described by Mr. Q. as elliptical, moniliform, finally separating, transparent, and containing seldom more than one, two, or three well-defined (greenish) granules.

The Ergot of Rye is sometimes called Spurred Rye (*Secale cornutum*) from its elongated and curved form, resembling the spur of a cock. It is either cylindrical or somewhat angular, tapering towards both extremities, from half, to an inch and a half in length, and two or three lines in diameter, with two furrows along its length, often terminated at the apex by a greyish projection. It is on the outside of a purplish colour, internally of a greyish-white with a tinge of red. The smell is peculiar, nauseous, and musty; the taste is slight, bitterish, a little acrid. Ergot is brittle, easily pulverised when dry. The surface, where glaucous, is found to be composed of sporidia, and the interior of the cellular tissue has the characters of the natural Albumen of the grain, within which are globules of oil, according to Mr. Quekett.

Most of the Ergot used is imported from the Continent and from America, and requires to be renewed every year or two, as it is apt to be destroyed by an Acarus, which produces much excrementitious matter.

Various analyses have been made of Ergot. Wiggers found in 100 parts a *fixed Oil* 35·00, Fungin 46, a peculiar principle called *Ergotine* 1·25, which has a heavy odour and a disagreeable acrid taste, and was supposed to possess all the active properties of the drug; besides these, a little Phosphoric acid combined with Lime, Potash, and Iron, a little Gum, Sugar, Albumen, Vegetable Osmazome, and Wax. The name *Ergotine* has been applied to an aqueous extract of Ergot of Rye, but the true *Ergotine*, as discovered by Wiggers, exists only in the proportion of about 6 gr. in the ounce. It is strongly narcotic. It is soluble in spirit, and not in water; whence it is argued by Ingenhohl that it cannot be the principle which promotes the contraction of the uterus, for aqueous infusions and decoctions of Ergot are often prescribed with advantage for this purpose. Dr. Wright states that the activity of the drug resides in the *Fixed Oil*, which may be separated from its powder by Ether, and this afterwards evaporated. Ether does not dissolve the *Ergotine*. And yet again Dr. Bertrand states that this fixed oil has no action on man or animals, and Kilian of Bonn has employed Ergot, which has been freed from oil by ether, with the best effect.

The active properties of Ergot are apparently extracted by boiling water, alcohol, and ether. (Neither of the supposed active principles is soluble in all of these menstrua.)

Action. Uses. The effects of Ergot were first observed in the diseases produced by it when taken for some time with the ordinary food, that is, in Convulsive Ergotism and in Gangrenous Ergotism, both accompanied with Formication. In single doses of ʒij., Dr. Wright and others have observed that it created nausea, vomiting, colic pains, and headache, sometimes stupor and delirium. In many cases it has also been observed to depress the pulse. Given to women when in labour, Ergot has been found so constantly to excite the labour pains and to cause the speedy expulsion of the child, that it has now become established as a safe and effectual remedy in cases where slowness of labour is dependent only on insufficiency of uterine contraction. It may be prescribed also for expelling the placenta, clots of blood, or hydatids; or to produce contraction, and restrain hæmorrhage. It has also been prescribed as an Emmenagogue, and as a general astringent.

D. ℈j.—ʒß. in fine powder, or with Syrup and some aromatic, repeated if necessary at intervals of 15 or 30 minutes, for two or three times. Dr. Wright recommends the Oil of Ergot, obtained by evaporating the Ethereal Tincture, whieh he finds to produce uterine contractions in doses of ♏xx.—♏l. which may be given in any convenient vehicle. The following preparations are likewise employed.

Infusum Ergotæ, D. Infusion of Ergot.

Prep. Infuse coarsely-powdered *Ergot* ℥ij. in *boiling Water* f℥ix. for one hour in a covered vessel, and strain.

D. f℥ß.—f℥ij. Probably contains Ergotine in combination.

Tinctura Ergotæ, D. Spirituous Tincture of Ergot.

Prep. Macerate for 14 days coarsely-powdered *Ergot* ℥viij. in *Proof Spirit* Oij. Strain, express, and filter.

D. f℥j.—f℥iij. Contains Ergotine.

Tinctura Ergotæ ætherea, L. Ethereal Tincture of Ergot.

Prep. Macerate for 7 days bruised *Ergot* ℥xv. in *Ether* Oij. Press and strain.

Introduced in 1851. First used by Dr. Lever.
D. f℥ß.—f℥ij. Contains the fixed Oil.

PRODUCTS OF FERMENTATION.

Organic substances are occasionally liable to undergo spontaneous decomposition, and to form new compounds, from the affinity which exists between their constituents. Some are very permanent in nature, as the vegetable acids and alkalis, also the resins; but others are ready to undergo a transposition of their elements when under the influence of an external agent, or, in other words, prone to pass into a state of fermentation. These substances belong to that group of organic products which contain Carbon along with Hydrogen and Oxygen in the proportion in which these two exist in water,—such as Starch, Sugar, and Mucilaginous substances; while the *ferments* belong to the *Albuminous* group, or such as contain much Nitrogen in their composition, as Gluten. The conversion of Starch or Fecula into Sugar, as exemplified in the ripening of fruit, or in the process of germination, and seen on a great scale in the operation of malting, is by some called *Saccharine fermentation.* But the term Fermentation is more expressly applied to the production of Alcohol and Carbonic gas at the expense of Sugar, as seen in *Vinous fermentation*, and to the further change which under peculiar circumstances takes place of Alcohol into Vinegar, called *Acetous fermentation.*

Alcohol, E. D. Sp. Gr. ·794—6, E. ·795, D.

Spiritus fortior, D. Stronger Spirit. Sp. Gr. ·818.

Spiritus Rectificatus, L. E. D. *Alcohol dilutum.* Rectified Spirit of commerce. Sp. Gr. ·838. ·840, D.

Spiritus Tenuior, L. E. D. *Alcohol magis dilutum.* Proof Spirit. Sp. Gr. ·920, L. D. ·912 (7 over Proof). E.

The process of distillation has been long familiar to the natives of India, as exemplified in their several *araks* or Spirits, and their Rose-water and *attar* of Roses. From them it was no doubt made known to the Arabs.

When Sugar is dissolved in water, and some ferment, such as *yeast*, is added, in a temperature of between 60° and 80°, brisk motion is

observed to take place, the liquid becomes turbid, froth collects upon its surface, Carbonic acid gas is copiously evolved, the impurities finally subside, and the liquid becomes clear. The Sugar has disappeared, and Alcohol, which has been produced, may be separated by distillation. The Sugar which has disappeared is equivalent to the united weight of the Alcohol and Carbonic acid gas which have been produced; but when Cane Sugar undergoes fermentation, one atom of water is first united with it, that it may be converted into Grape Sugar. Gay-Lussac calculated that 90·72 parts of Sugar are capable of supplying 46·68 parts of Alcohol, and 44·24 of Carb′ gas, making together 90·72, or an equal weight. Alcohol is composed of $C_4 H_6 O_2$, and an equivalent of Grape Sugar, $C_{12} H_{12} O_{12}$, will break up into 2 equiv. of Alcohol, and 4 of Carb. acid.

Spirit, however, is obtained from Cane Sugar in the East and West Indies, in the form of Rum. On the Continent it is obtained chiefly from the juice of the Grape, which contains all the elements for due fermentation. Spirit may also be distilled from feculent roots, as Potatoes; or from grain, as Rice in India, or malted Barley, as in this country. In these latter cases the Fecula or Starch has first to be converted into Grape Sugar, before the vinous fermentation takes place. The Spirit first obtained is comparatively weak, being mixed with some water and a trace of Essential Oil, which is known by the name of *Grain Oil.* In this state it is usually called *Raw Spirit.* By a second distillation it is freed from much of this water and Oil, and may be procured of the Sp. Gr. of ·835, which is the strongest *Rectified Spirit*, or *Spirit of Wine* of commerce, but which still contains about 13 or 14 per cent. of water. This is rather above the standard of the officinal Rectified Spirit.

Pure Spirit, or *absolute alcohol*, may be obtained by distilling this with half its weight of fresh quicklime. Its specific gravity is ·794. Its composition is $C_4 H_6 O_2$—or *theoretically*, $C_4 H_5 O, HO$, as it is considered to be a hydrated oxide of the radical *Ethyle* ($C_4 H_5$).

SPIRITUS RECTIFICATUS. Sp. Gr. ·838 at 62°. "Colourless; not rendered turbid by water, nor reddened by the addition of Sulphuric acid. This may be reduced to the state of Proof Spirit by diluting 5 pints of it with 3 pints of distilled water." L. "f℥iv. treated with *Sol.* of *Nitrate of Silver* gr. ij., exposed to bright light for 24 hours, and then passed through a filter purified by weak Nit′, so as to separate the black powder which forms, undergo no further change when expossd to light with more of the test." E.

This black powder is derived from the decomposition of the Salt of Silver, by means of the small quantity of Grain Oil which Rectified Spirit still contains, and from which it is with difficulty freed. Its presence may also be detected by the reddening with an equal vol. of pure Sul′. The properties of Rectified Spirit are essentially the same as those of Alcohol; it is an excellent solvent for many of the officinal Resins, some of which it dissolves more than Alcohol. Rectified Spirit still contains water to the extent of $\frac{1}{10}$ or $\frac{1}{11}$, or 18 water to

82 Alcohol in 100 parts; and, as a stronger Spirit is required for some purposes, processes are given for getting rid of much of this water.

Alcohol is officinal in the E. and D. P. It contains no water. The E. C. prepares it by distilling Rect. Spirit with Lime, as mentioned above. This Lime entirely abstracts the water, and remains in the retort with it until all the spirit has been distilled over. 17 oz. of Alcohol may thus be separated from 1 pint of Rect. Spirit. The directions of the D. C. are similar, only that the 2 oz. which first come over are to be rejected. *Spiritus fortior*, or Stronger Spirit, is also officinal in the D. P. It is obtained by shaking dry Carb, Potash ℥viij. with Cß. of Rect. Sp. in a bottle for 4 hours at a temperature of 100°. The liquid separates into 2 strata; below is a solution of Carb. Pot. in water; above, is a layer of Spirit, measuring about 74 oz. To purify this, 72 oz. are distilled off. Stronger Spirit has a Sp. Gr. of ·818, and is thus intermediate in strength between Alcohol and Rectified Spirit. It consists per cent. of 90 parts of Alcohol, and 10 of water. Chloride of Calcium used to be employed by the L. C. for the preparation of Alcohol, as it has a very great affinity for water. But it differs from Carb. Potash in being soluble in Alcohol; the latter must therefore be distilled off it. The Alcohol of the Excise regulations has a Sp. Gr. of ·825. Alcohol, when pure, is light, limpid, and colourless, of a peculiar, rather agreeable odour, and a warm, burning taste. It is very volatile, and produces considerable cold during its evaporation. Its boiling point is from 173° to 175°, when Sp. Gr. is ·820 at 60°. The stronger the Alcohol, the lower is the boiling point. Sp. Gr. of its vapour 1·613. It burns readily, without smoke, water and Carb′ being produced. It has never been frozen; and is hence well adapted for making thermometers for ascertaining cold. It unites with water in all proportions, some condensation and evolution of heat taking place. It is a powerful solvent of many substances, as the Vegeto-Alkalis and the Fixed Alkalis (but not their carbonates), many crystalline neutral Resins, Volatile and Fixed Oils; also some elementary substances, as Iodine, and many salts.

SPIRITUS TENUIOR. Proof Spirit. Sp. Gr. ·920, as defined by the laws of Excise. L. D. Sp. G. ·912 (7 over proof.) E. The other tests as for Rectified Spirit. Dr. Christison states that the E. C. adopted the standard of Proof Spirit ·920 in its Pharmacopœia of 1839, but had been led to alter the density to ·912, because a Spirit of this strength, which is produced by mixing *one measure of water* and *two of commercial Rectified Spirit,* has been long adopted in practice for preparing Tinctures by all the leading druggists of Edinburgh.

The properties of Proof Spirit are necessarily of the same nature as Rectified Spirit, and though weaker as a solvent of some things, especially Gum Resins, it is sufficiently strong for the majority of officinal tinctures. And though it consists of nearly one-half Alcohol, it is sufficiently powerful as a stimulant. It is made by mixing 5 pints of the Rect. Spirit of the L. C. (·838) with 3 of

Dist. water. The D. C. mix 7 pints of Sp. Gr. ·840 with 4 of water. Both of these preparations contain 51 of water, and 49 of Alcohol, in 100 parts.

Spiritus Vini Gallici, L. Spirit of French Wine. Brandy.

Spirits distilled from various fermented substances form our several varieties of Ardent Spirit, which may be considered as Alcohol diluted to the strength of Proof Spirit, and mixed with some volatile ingredients. Brandy, because made from Wine, is distinguished as being free from Grain Oil. Rum is obtained from fermented Molasses. Whiskey from malted Barley or Rye. Holland Gin is prepared from malted Barley and Rye, and rectified with Juniper Berries. Common Gin from malted Barley, Rye, or Potatoes, and rectified with common Turpentine. The *Arrak* of the East is described as being made from Rice; but the word signifies Spirit, and it is made from a variety of substances. Mr. Brande has ascertained that these several spirits contain from 51 to 54 per cent. of Alcohol.

Action. Uses. All are Diffusible Stimulants, and well known for their intoxicating properties. Even in moderate quantities they produce temporary excitement of all parts of the system, followed by corresponding depression. In small quantities they are sometimes useful to health; but in general their use can be abstained from with benefit. Dr. Paris has particularly distinguished Brandy as being Cordial and Stomachic; Rum as Heating and Sudorific; Gin and Whiskey both as Diuretic. Spirit diluted is often used as a cooling lotion, but it must then be allowed to evaporate; if covered up, it will act as a Rubefacient. Both Alcohol and Proof Spirit are used as solvents for numerous officinal preparations.

Mistura Spiritus Vini Gallici, L. Brandy Mixture.

Prep. Mix together *Brandy* and *Cinnamon-water* āā f℥iv., with the *Yolks of* 2 *eggs, pure Sugar* ℥ß. and *Oil of Cinnamon* ♏ij.

Action. Uses. A Cordial Stimulant. Useful in cases of depression, when the rapid action of a diffusible stimulant is required, as in the sinking stage of typhus.

Vinum Xericum, L. Vinum album, E. Vinum album Hispanicum, D. Sherry Wine.

Sherry, commonly called White Wine, is officinal as a solvent for some active medicinal substances. Wine is also itself employed beneficially as a Stimulant. Though all fermented liquors obtained from the juice of fruits are called Wines, good Wine is prepared only from the Grape, because its juice (v. p. 358), besides Sugar dissolved in a large portion of water,—and a glutinoid substance, or vegetable albumen, in its husk,—contains, as its acid principle, Bitartrate of Potash, which, being insoluble in Alcohol (v. p. 95), is deposited as the fermentation proceeds, and thus removes a great portion of the

acid out of the Wine. The albuminous matter of the Grape juice, absorbing Oxygen from the atmosphere, and passing into decomposition, thus acts as a ferment to the Sugar, and causes it to be converted into Alcohol, when the changes take place which have already been described. Besides this, there is also developed a little Volatile Oil, and, according to Liebig and Pelouze, a small quantity of an aromatic substance, which they have called Œnanthic Ether, to which, and also to the oil, wines owe their peculiar flavour. Differences are observed in the Wines of every locality; they are sometimes divided into *dry* and *sweet* Wines; also into *still* and *sparkling*. Thus, in cases where the proportion of Sugar is small, and that of the albuminous matter large, the Sugar becomes entirely converted into Alcohol, the Wine is said to be dry, and, having become *still*, may be kept for some time to ripen. In other cases, where the proportion of ferment is small, and that of the Sugar large, the latter partly remains unconsumed, and the Wine is sweet. *Sparkling* Wines are those which have been bottled before the fermentation, though advanced, has entirely ceased; the Carb' gas, which naturally escapes as soon as the pressure is removed, causing the appearance of sparkling. The acidity of Wine may be caused by Bitartrate of Potash, or by the formation of Acetic Acid. The colour of Wine is of different degrees of straw-colour when the juice of the Grape is alone used; but it becomes red when the skins or husks are left in the liquor while in a state of fermentation. As ascertained by Mr. Brande, the stronger Wines, such as Lissa, Raisin Wine, Marsala, Port, Madeira, Sherry, Teneriffe, Constantia, Malaga, contain from 18 or 19 to 25 per cent. of Alcohol. The lighter Wines, such as Claret, Sauterne, Burgundy, Hock, Champagne, Hermitage, and Gooseberry Wines, from 12 to 17 per cent. of Alcohol. Wines are considered less intoxicating than Spirit and water of the same strength, because the Alcohol, being combined with the Mucilaginous, Extractive, Colouring, and Astringent principles of the Wine, is supposed to be in this state less diffusible in its action. Sherry is preferred as a solvent, in consequence of being more free from colouring matter, and containing less acid. As a Cordial and Tonic, Wine must be selected according to the nature of the case.

CEREVISIÆ FERMENTUM, L. D. Yeast.

Though neither Ale nor Beer are officinal, they may be noticed as differing from Wine, in containing a larger proportion of mucilaginous and extractive matters, derived from the Malt with which they are made. They often contain a free acid, or are ready to enter into the acetous fermentation. The bitter principle of the Hop assists in preserving Malt liquors, as well as adds to their tonic effects. According to Mr. Brande, Ale and Porter contain from 4 to near 10 per cent. of Alcohol. The *Yeast*, which makes its appearance on the surface of fermenting Wort, and is produced from the Glutinoid sub-

stance in the brewing of Malt liquors, is itself officinal. It is a light, soft substance, of a greyish yellow colour, which readily putrifies if kept moist; if dried, it becomes brownish, and may be kept for some time. When magnified, it appears composed of vesicles containing globules, and is, in fact, entirely composed of a minute fungus, consisting of microscopic cellules, separate, or in rows. It has been named *Torula Cerevisiæ.*

Action. Uses. Stimulant when applied externally, and used in the form of a poultice.

CATAPLASMA FERMENTI, L. Yeast Poultice.

Prep. Mix *Beer Yeast,* and *Water* heated to 100°, āā f℥v., add *Flour* ℔j., and stir to make a cataplasm. Place it near the fire until it rises. (Fermentation is induced in the saccharine part of the flour, Carbonic acid being disengaged, and a small quantity of alcohol produced.)

ÆTHER, L. Æther Sulphuricus, E. D. Ether.

If Alcohol, or, better, if Rectified Spirit, be mixed and distilled with Sulphuric Acid, a light, very inflammable liquid is produced, which is well known by the name of Ether, being also called Rectified, and Sulphuric Ether. The Ethers produced by the action of other acids besides Sulphuric contain a portion of each acid or its elements, differ essentially from each other, and are distinguished by the name of the particular acid used.

Sulphuric Ether is colourless and transparent, very light and limpid, of a powerful and peculiar, but rather pleasant odour, and of a warm pungent taste, afterwards feeling cool. Sp. Gr. ·724 at 55° F., according to Mitscherlich. It is extremely volatile. The Sp. Gr. of its vapour is high, being 2·586. It evaporates even in pouring from one vessel to another, feeling very cold if evaporated from the surface of the hand ; and, being very inflammable, it is apt to take fire on the near approach of a light. Its vapour, when inhaled, first exhilarates, then produces a kind of intoxication, and subsequently, if given in sufficient quantity, causes complete anæsthesia, or insensibility to the feeling of pain. It boils at 96°, under the ordinary pressure of the atmosphere, and has been frozen at —47°, becoming a white, crystalline mass. It burns with a bright flame, producing Carbonic Acid and water. When much exposed to the atmosphere it becomes by degrees converted into Acetic acid and water. Ether may be mixed in all proportions with Alcohol, and one part with nine of water. It readily dissolves Resins, Caoutchouc, Volatile and Fixed Oils; Sulphur and Phosphorus in a smaller proportion; several Vegeto-Alkalis, and some neutral crystalline principles. Ether is composed of $C_4 H_5 O$; its elements constitute an Oxide of the base Ethyle ($C_4 H_5$), which has lately been isolated by Gerhardt.

Prep. One equivalent of Ether and one of water make up an equivalent of Alcohol. When equal parts of Rectified Spirit and strong Sulphuric acid are

mixed together, and submitted to distillation, Ether distils over, the atom of water being left behind with the acid. But it is not a simple abstraction of the elements of water by means of the Sulphuric acid; the change is more complicated. If the spirit and acid are mixed, raised to the boiling point, and then left to cool, a peculiar compound acid, called Sulpho-vinic acid, is formed. It contains the elements of one equivalent of alcohol, and 2 of Sulphuric acid. ($C_4H_5O, HO, 2SO_3$). But as soon as the liquid is submitted to distillation, this compound acid is again decomposed, Ether distilling over, and Sulphuric acid and water remaining in the retort.

The difficulty of the process consists in the fact, that it only goes on properly when conducted at a certain temperature. Sulphuric acid distils at a high temperature, and Rectified Spirit at a low one; and the distilling point of the mixture depends upon the proportions of these ingredients. If so much Spirit be present that the boiling point is below 260° F., Alcohol is found to distil over, instead of Ether. Or when there is so much acid that the boiling point is above 320°, a number of empyreumatic products are formed, as Olefiant gas, and Heavy Oil of Wine. The boiling point may vary from 260° to 320°, or should be as close as possible to 280°, to ensure the production of a pure Ether. But as the process goes on, the Ether distilling, and the amount of spirit in the retort diminishing, the boiling point tends to rise, and the product will at length be contaminated by the above-mentioned compounds. To remedy this difficulty the *continuous process* was invented, which consists in the continual addition of fresh quantities of Rectified Spirit to the fluid in the retort. By this means the boiling point is kept down to the proper standard, and it is found that the same quantity of Sulphuric acid is sufficient for the etherification of a large quantity of alcohol.

On this principle are founded the formulæ of the E. and D. Pharmacopœias. The L. P. gives no process.

Prep. E. Take of *Rectified Spirit* f℥l., *Sulphuric Acid* f℥x. Pour f℥xij. of the Spirit gently over the Acid contained in an open vessel, and then stir them together briskly and thoroughly. Transfer the mixture immediately into a glass mattrass connected with a refrigeratory, and raise the heat quickly to about 280°. As soon as the ethereal fluid begins to distil over, supply fresh Spirit through a tube into the mattrass in a continuous stream, and in such quantity as to equal that of the fluid which distils over. This is best accomplished by connecting one end of the tube with a graduated vessel containing the spirit, — passing the other end through a cork fitted into the mattrass,—and having a stop-cock on the tube to regulate the discharge. When f℥xlij. have distilled over and the whole spirit has been added, the process may be stopped. Agitate the impure Ether with f℥xvj. of a saturated solution of Muriate of Lime, containing about ℥ß. of Lime recently slaked. When all odour of sulphurous acid has been thus removed, pour off the supernatant liquor, and distil it with a very gentle heat so long as the liquid which passes over has a density not above ·735. More Ether of the same strength is then to be obtained from the solution of Muriate of Lime. From the residuum of both distillations a weaker Ether may be obtained in small quantity, which must be rectified by distilling it gently again.

D. Take of *Rectified Spirit* Oiij., *Oil of Vitriol* of commerce f℥viij., fresh burned *Lime* in powder ℥j. Mix the acid and ℥x. of the spirit in a glass mattrass, capable of holding a quart at least, and without allowing the mixture to cool, connect the mattrass with a Liebig's condenser, and applying a sufficient heat to maintain the liquid in brisk ebullition, commence the distillation. As it proceeds, admit gradually through a glass tube traversing the cork of the mattrass, the remainder of the spirit, regulating its influx so that the boiling liquid shall maintain a constant level; and, when the entire of it has been introduced, continue the application of the heat until the contents of the mattrass become black, and show a tendency to froth over. The Ether which is obtained is agitated with the Lime (which abstracts any water, sulphuric, or sulphurous acid), and then rectified, continu-

ing the distillation as long as the Sp. Gr. of the product remains as low as 750°. Preserve in a cool place in accurately stopped bottles.

Tests.—Ether is apt to be adulterated with Rectified Spirit and a little water. Sometimes it contains Ethereal Oil. The following are the tests for Ether in the L. P. "It is colourless; the Sp. Gr. does not exceed ·750; exposed to the air it evaporates away; it scarcely, or not at all, reddens litmus. One ounce will not mix thoroughly with less than half a pint of water." When thus diluted with water, it remains limpid; the presence of Ethereal oil will cause turbidity. E. Sp. Gr. ·735, or under: when agitated in a minim measure with half its volume of concentrated solution of Chloride of Calcium, its volume is not lessened: (if Spirit be present, it will be absorbed, and the Ether will float at the surface, diminished in bulk). The L. and D. preparations, as evident by the Sp. Gr., are allowed to be weaker than the E. Sulphuric Ether.

Action. Uses. Diffusible Stimulant and Antispasmodic; Carminative. Frequently prescribed in Spasmodic affections, and often to relieve Flatulence. In Hysterical and in Nervous complaints in general, in Dyspnœa, Nervous Colic, and similar affections, it is very effective, especially if prescribed with Laudanum, or a solution of the Salts of Morphia.

Shortly before the discovery of Chloroform, it was found that when Ether was allowed to be inhaled into the lungs, it gradually produced insensibility to feeling and pain. It was therefore employed as an Anæsthetic in surgical operations. But having been found less efficient than Chloroform, and more irritant to the nervous system, its use for this purpose has been nearly abandoned.

D. ♏xv.—f℥j. and repeated in a short time if necessary.

SPIRITUS ÆTHERIS SULPHURICI, E. Spirit of Ether.

Prep. Mix *Sulphuric Ether* Oj. with *Rectified Spirit* Oij. The density of this preparation ought to be ·809.

SPIR. ÆTHERIS COMPOSITUS, L. Spiritus Æthereus Oleosus, D. Compound Spirit of Ether.

Prep. L. Mix together *Ether* f℥viij., *Rectified Spirit* f℥xvj., *Ethereal Oil* f℥iij.

D. Similar. Æthereal Oil is first prepared, in the same way as above, and then mixed with Spirit and Ether.

Action. Uses. Stimulant, Antispasmodic, Anodyne; hence useful in cases of Nervous Irritation, and want of sleep, often prescribed with Opiates, in doses of f℥ß.—f℥ij.

COLLODION. This name is applied to the solution in ether and spirit of a peculiar kind of gun-cotton. The common explosive cotton is not adapted for the purpose. Cotton is dipped in strong Sul-

phuric acid saturated with Nit. Potash. 8 parts of this, when dry, are shaken in a bottle with 125 parts of pure Ether; 8 parts of Rectified spirit being then added, the mixture is again shaken, and the syrupy liquid finally strained through a cloth (Mialhe). No water must be used. This viscid transparent liquid is used as an application to cuts and sores, or to any part of the skin which requires protection. The Ether and Spirit evaporating, there is left a dry, elastic, and transparent coating, which firmly adheres to the surface.

OLEUM ÆTHEREUM, L. Ethereal Oil. *Heavy Oil of Wine.*

This substance is formed towards the end of the distillation of Sulphuric Ether, or produced by distilling spirit with an excess of Sulphuric acid. It is an oily-looking liquid, which when washed has a bitter, somewhat aromatic taste, and a peculiar odour. It is insoluble in water, but soluble in Rectified Spirit and in Ether.

Prep. Mix *Rectified Spirit* Oij. cautiously with *Sul'* f℥xxxvj. and distil until a black froth appears, when the retort is to be immediately removed from the fire. (Ether, water, Sulphurous acid, and an oily liquid which floats upon the water, are produced.) The light fluid is to be separated from the heavier, and to be exposed for a day to the air. (The Ether present evaporates.) *Sol. of Potash* f℥j. or q. s. mixed with an equal quantity of water, is to be well shaken with the oily liquid. (The free Sulphurous acid is removed.) Separate the Ethereal Oil which subsides, and wash it well.

Tests. L. P. "It has a Sp. Gr. of 1·05. If dropped into water it immediately falls to the bottom, preserving a globular form. It is soluble in Ether. It does not redden Litmus." Ethereal Oil, when boiled in water, separates into Sulphovinic acid (*v.* p. 700,) and a light liquid hydrocarbon, called *Etherine*, or *Light Oil of Wine*, which is composed of $C_4\,H_4$. The Heavy Oil is found on analysis to contain the elements of one equiv. of each of these substances, minus an atom of water. It is therefore supposed to contain a Sulphate of Ether, and a Sulphate of Etherine, ($C_4\,H_5\,O,\,S\,O_3 + C_4\,H_4,\,S\,O_3$). But it varies somewhat in composition.

This Oil, though officinal, is not used medicinally by itself, but forms an ingredient in the Compound Spirit of Ether, which is intended as a substitute for the Anodyne liquor of Hoffman.

SPIRITUS ÆTHERIS NITRICI, L. E. Spir. Æthereus Nitrosus, D. Spirit of Nitric Ether. Hyponitrous Ether dissolved in Rectified Spirit. Sweet Spirits of Nitre.

Prep. E. Take of *Rectified Spirit* Oij ,and f℥vj., *pure Nitric acid* (Sp. Gr. 1·500) f℥vij. Put f℥xv. of the Spirit, with a little clean sand, into a two-pint mattrass, fitted with a cork, through which are passed a safety-tube terminating an inch above the Spirit, and another tube leading to a refrigeratory. The safety-tube being filled with pure Nitric acid, add through it gradually f℥iijß. of the acid. When the ebullition which slowly rises is nearly over, add the rest of the acid gradually, f℥ß. at a time, waiting till the ebullition caused by each portion is nearly over before adding more, and cooling the refrige-

ratory with a stream of water, iced in summer. The Ether thus distilled over, being received in a bottle, is to be agitated first with a little milk of lime, till it ceases to redden litmus-paper, and then with half its volume of a concentrated solution of Muriate of Lime. The pure Hyponitrous Ether thus obtained, which should have a density of ·899, is then to be mixed with the remainder of the Rectified Spirit, or exactly four times its volume.

Spirit of Nitric Ether ought not to be kept long, as it always undergoes decomposition, and becomes at length strongly acid. Its density by this process is ·847. E.

L. P. Add gradually *Nitric Acid* f℥iijß. to *Rectified Spirit* Oij. and distil f℥xxviij.

D. P. Hyponitrous Ether is first prepared as in the E. P. This is purified by shaking with solution of Ammonia, to free it from acid, and then mixed with the spirit. But in strength it is about the same as the L. prep.

This preparation is wrongly named, as it does not contain true Nitric Ether. When Spirit is thus acted upon by Nit. acid, the latter loses two equivalents of Oxygen, becoming Hyponitrous acid. By the oxygen set free, part of the Alcohol is decomposed; water, Carbonic acid, and often other more complex substances, being produced. But another part of the Spirit is separated into Ether and water, and the Hyponitrous acid combines with the former to produce Hyponitrous Ether ($C_4\ H_5O,\ N\,O_3$). The officinal preparation consists of this substance dissolved in Rectified Spirit. In the E. P. one part is ordered to be mixed with four of the latter. In the L. P. a large proportion of spirit is distilled with the acid, so that the solution of the Ether in Spirit is at once obtained in the condenser. The result is less than half as strong as the E. prep.

Pure Hyponitrous Ether has a pale yellow colour, and an ethereal smell resembling that of ripe apples. Its Sp. Gr. is about ·890°. It is very volatile, boiling at about 70°, and exceedingly inflammable. It mixes with Alcohol and Ether in all proportions, and is soluble in about 50 parts of water.

The E. Spirit is of a light straw colour; that of the L. P. colourless, having the peculiar but agreeable odour and flavour of the Hyponitrous Ether, though of course less strong. It is mobile, volatile, and inflammable, almost always a little acid, especially if it has been kept any time. It mixes in all proportions with water, and with Alcohol. The Sp. Gr. varies much; but the strength may also be ascertained by the E. method.

Tests.—It is apt to be adulterated by the addition of spirit or water, and to spoil by keeping, from the formation of Nitrous Acid. "Sp. Gr, ·834. It slightly reddens litmus, and does not effervesce with Carbonate of Soda." L. "Sp. Gr. ·847. It effervesces freely, or not at all, with solution of Bicarbonate of Potash. When agitated with twice its volume of concentrated solution of Chloride of Calcium, 12 per cent. of Ether slowly separates." E.

Action. Uses. Stimulant and Antispasmodic. Diuretic, and, by management, Diaphoretic, in doses of f ʒß.—f ʒij. As a Diuretic it is best combined with others, as Squills, Acetate of Potash, &c.

CHLOROFORMYL, L. Chloroformum, D. Chloroform. Terchloride of Formyle.

Chloroform ($C_2 H, Cl_3 = 121$) is the Terchloride of a hypothetical radical, called *Formyle* ($C_2 H$), the Teroxide of which is known under the name of *Formic acid.*

Chloroform was discovered by Soubeiran in 1832. In 1842 Dr. M. Glover investigated its action on animals. But it was not until 1847 that it was introduced to the profession as an anæsthetic agent by Dr. Simpson of Edinburgh. It was first obtained by the action of caustic alkalis upon Chloral, a peculiar liquid obtained by passing Chlorine gas into anhydrous alcohol. But it is more easily prepared by distilling alcohol, or wood spirit, with Chlorinated Lime.

Prep. L. Place in a retort *Chlorinated Lime* ℔iv., previously mixed with *Water* Ox. To these add *Rectified Spirit* Oſs., and let the mixture fill no more than one third of the retort. Heat in a sandbath, and, as soon as ebullition begins, withdraw the fire, lest the retort be broken by the suddenly increased heat. Let the liquid distil into the receiver so long as nothing separates from it, reapplying the fire, whenever it may be required. To the distilled liquid add four times as much *Water*, and shake them well together. Carefully separate the heavier portion which subsides; add to it *Chloride of Calcium* ℥j., broken into fragments, and frequently agitate for an hour. Lastly, again distil the liquid from a glass retort into a glass receiver.

D. Slake *fresh Lime* ℔v. with *Aq.* Oij., first raised to a boiling temperature, and introduce it into a sheet-iron or copper still along with *Chlorinated Lime* ℔x. Pour on them *Water* Civ. mixed with *Rect. Spirit* f℥xxv., both raised to a heat of 100°. Connect with a condenser, and apply heat, which is to be withdrawn as soon as the distillation commences. The distilled product, the bulk of which need not exceed a quart, will occur in two distinct strata, the lowest of which is crude Chloroform. Let this be agitated twice in succession, first with an equal volume of distilled water, and then in a separate bottle with ½ its volume of pure *Sulphuric acid.* Lastly, shake it in a mattrass with finely-powdered Peroxide of Manganese ℥ij. and rectify from off this at a very gentle heat.

The process of the L. P. resembles that detailed some years ago by M. Dumas, with the exception, that the latter purified his product by agitation with ½ its volume of Sulphuric acid. This plan was imitated by Professor Gregory of Edinburgh, and at one time was extensively adopted by the manufacturers. It is introduced in the D. P., but it is decidedly unsafe and unadvisable. It was early condemned as unnecessary by Soubeiran, and the decomposition of the Chloroform purified by this mode has been since admitted by Dr. Christison. The acid appears to combine with and to remove some oily impurity, which causes it to blacken, and the Chloroform thus treated, being separated from the acid by mixing with Carbonate of Baryta or Peroxide of Manganese, and then distilling, appears for some time unexceptionably pure. But the contact of the strong acid has in some way rendered it liable to undergo destructive change. After a variable time, perhaps some months, or more quickly if exposed to air and light, the Chloroform thus prepared becomes acid to litmus paper, and acquires a suffocating odour. It then contains Hydrochloric acid and free Chlorine; and a peculiar greenish oil has been observed to form, and to adhere to the sides of the bottle. This decomposed liquid is dangerously irritant, and totally unfit for medical use.

The only safe way known of purifying Chloroform consists in agitation with pure water, and redistillation. (See P. J. x. 25, 253.)

Some complex chemical changes take place in this process.

Calx Chlorinata (p. 123) consists of *Hypochlorite of Lime* (Ca O, Cl O), and Chloride of Calcium. The Hypochlorite is the substance concerned in these changes. It is supposed that the first step is the formation of *Chloral* ($C_4H\,Cl_3O_2$), a substance already mentioned as giving rise to Chloroform when acted upon by alkaline substances. It is a thin, colourless, volatile liquid, of a penetrating odour. 2 equivalents of Alcohol and 8 of Hypochlorite of Lime, contain the elements of 1 equivalent of Chloral, 1 of Lime, and 9 of water,—with 5 of Chloride of Calcium, and 2 of Formiate of Lime.

$$C_8\,H_{12}O_4+Ca_8\,O_8, Ca_8\,Cl_8=C_4\,H\,Cl_3\,O_2+Ca\,O+9\,H\,O$$
$$+5\,Ca\,Cl+2\,(Ca\,O,\,C_2\,H\,O_3).$$

In the next change the salts of Lime, placed at the end of the equation, are unconcerned. The *Chloral* and *Lime*, with one out of the nine atoms of *water*, react upon each other, so as to produce one equivalent of *Chloroform*, which distils over, and one more of *Formiate of Lime*, which remains behind in the retort.

$$C_4\,H\,Cl_3\,O_2+Ca\,O+H\,O=C_2\,H\,Cl_3+Ca\,O,\,C_2\,H\,O_3.$$

Chloroform is a transparent, colourless, oily, heavy fluid. Its Sp. Gr. is 1·48 to 1·5. It has a fragrant ethereal odour, rather resembling that of apples, and a burning, but sweet and pleasant taste. It is slightly soluble in water, (in 2000 parts, Christison), very soluble in alcohol and ether; it dissolves volatile Oils, Camphor, Resins, Wax, Caoutchouc, and some vegetable Alkaloids. It also dissolves Iodine and Bromine, and, according to Liebig, Sulphur and Phosphorus. It is volatile without change. It boils at 141°, and is entirely dispelled by heat; it can be inflamed with difficulty, having a greenish flame. It also evaporates quickly at ordinary temperatures. The Mineral acids tend to decompose it; Nit. acid immediately; Sulph. and Hydrochlor. acids slowly. Boiled for some time with a caustic alkali, it is decomposed, a chloride and a formiate of the base being produced.

Tests. L. P. "It is colourless, with a pleasing odour, and a Sp. Gr. not less than 1·48. It is nearly soluble in water. It does not redden litmus. Rubbed on the skin, it soon disperses, scarcely any odour being left." The meaning of these tests will be rendered clear by a brief consideration of the impurities and adulterations to which Chloroform is liable.

1. *Alcohol* is frequently present in commercial Chloroform. The Sp. Gr. is reduced by it. Pure Chloroform, dropped into water, falls to the bottom, and remains bright and limpid; but if it contain Alcohol, the surface of the drop becomes opaline. If the same experiment be made with diluted Sulph. acid of Sp. Gr. 1·44, the drop of pure Chloroform will fall to the bottom; but that which contains spirit, if not shaken, will float or remain suspended in the acid solution. (Acar). Pure Chloroform will not readily take fire, but it does so immediately when ether or alcohol is present.

2. *Ether* is sometimes added; and the tests for its detection are very much the same as those for Alcohol. M. Raboudin further states that a solution of Iodine in pure Chloroform has a violet colour; but that when the latter contains any Ether, this solution becomes reddish. The presence of Ether in any amount would considerably lower the specific gravity.

3. *Chloral* may be present, when the quantity of Lime used in the process is insufficient to render the decomposition perfect. It has a penetrating odour, and a Sp. Gr. of 1·5; but it is not easy to detect it.

4. *Heavy Volatile Oils.* Some unknown compounds of this description, having a powerful odour, and injurious action on the organism, are occasionally found in inferior specimens. A drop of such Chloroform, when allowed to evaporate from the palm of the hand, will leave a strong smell behind it. The liquid will also blacken Sulphuric acid, if shaken with it. Such impurities are more likely to occur when the Chloroform has been prepared from Pyroxylic Spirit.

5. *Hydrochloric Acid* and *free Chlorine* are produced by the decomposition to which Chloroform is liable when prepared by a faulty process. The liquid has then the odour of Chlorine, and causes fumes with the vapour of Ammonia; it first reddens litmus paper (H Cl), and subsequently bleaches it (Cl); and it precipitates a solution of Nitrate of Silver.

6. *Sulphuric Acid* and *Manganese* may be present when the process of the D. C., or that recommended by Dr. Gregory, has been adopted. By contamination with some compound of Manganese, the Chloroform may be caused to assume a pink colour.

Action. Uses. The action of Chloroform in a small dose is simply stimulant and cordial; in larger quantity it produces inebriation; in still larger doses it brings on a complete loss of feeling, and unconsciousness, or may cause death by a cessation of the heart's action. It paralyses the muscular system, in the same manner as Opium, but still more effectually. Internally, in small doses, it is employed in spasmodic disorders, and as a stimulant and diaphoretic.

But the great use of Chloroform depends upon its remarkable action in producing, when its vapour is gradually inhaled (along with air) into the lungs, a complete insensibility to the feeling of pain. For this its inhalation is now most extensively adopted as a merciful preliminary to the painful operations of surgery. The patient is usually unconscious; but in the great majority of cases the employment of the remedy is safe,—though fatal cases have rarely occurred. Chloroform is used by some to mitigate the pains of parturition. For its relaxing power over muscle, it is employed to assist in the reduction of dislocations, and of strangulated herniæ.

Dose. Internally, ♏v.—x., dissolved in spirit, or suspended by means of mucilage or yolk of egg. For inhalation, f ʒj. should be

employed at first, and repeated as often as may be necessary. It should be breathed gradually from a handkerchief held near the mouth or applied in one of the inhalers invented for the purpose.

SPIRITUS CHLOROFORMYL.

A solution of 1 part of pure Chloroform in 7 of Rectified Spirit has been lately much used under the fictitious names of *Chloric Ether* and *Terchloride of Carbon*. It is employed as a cordial and antispasmodic in low fevers and convulsive affections.

D. ♏xx.—f ʒj.

ALCOHOL AMYLICUM, D. Amylic Alcohol. Fusel Oil.

Fusel Oil, or *Oil of Grain*, is a light, colourless, oily fluid, with a strong odour, which may be obtained at any large distillery by continuing the distillation for some time after the pure spirit has been all drawn off. Having been first noticed in the distillation of spirit from Potatoes, it is often called *Oil of Potato spirit.* The D. C. purify it by re-distillation, rejecting the water which comes over first. Fusel Oil is the Alcohol, or Hydrated Oxide, of a hypothetical radical, *Amyle* ($C_{10} H_{11}$). Its composition is $C_{10} H_{11} O, H O$. When treated with oxidizing agents, it is converted into *Valerianic Acid* ($C_{10} H_9 O_3$), undergoing a change similar to that of Alcohol into Acetic Acid. Fusel Oil is employed by the D. C. in the preparation of *Valerianate of Soda* (*q. v.*).

ACETOUS FERMENTATION AND DESTRUCTIVE DISTILLATION.

Acetic Acid exists occasionally in plants, either in a free state, or combined with Potassa, Soda, Lime, &c. Vinegar, being producible by simply exposing to a warm temperature the liquors which have undergone, or are susceptible of, the vinous fermentation, has been known from the earliest times. But in all cases some ferment requires to be present, as these substances must first undergo the vinous fermentation; for it is the Alcohol which is the subject of Acetous fermentation, and it may in other ways be made to yield the same products. Thus, though Alcohol when burnt in the open air produces Carbonic Acid and water, if, when diluted with a little water, it be dropped by degrees upon finely-divided Platinum, the Oxygen of the air, attached to the extended surface of the metal, coming in contact with the thin film of spirit, by combining with, changes its nature, and converts it into Acetic Acid, the vapours of which may easily be perceived by their pungent odour. So the same spirit, with a little yeast, exposed to the action of the air, will speedily become converted into Acetic Acid. In undergoing this change, the Alcohol unites with 4 equivalents of Oxygen to form 1 equivalent of Acetic Acid and 3 of water.

$$C_4 H_6 O_2 + 4 O = C_4 H_3 H_3 + 3 H O.$$

Vinegar on the Continent is made by exposing Wine to the action

of the air in partially filled vessels. In this country a less pure Vinegar is made from an inferior kind of Beer, to which $\frac{1}{1000}$ part of Sul′ is allowed to be added, to prevent further change from taking place. Several of these forms of Vinegar are officinal. Acetic Acid may also be obtained by the destructive distillation in close vessels of some hard dry woods (*v.* Pyroligneous Acid). All of these products are diluted forms of Acetic Acid, which may, however, be obtained from them in a concentrated state.

ACETUM (Britannicum), L. E. Common or British Vinegar. Prepared by fermentation from an infusion of Malt, L.

The old plan of making Vinegar was to expose a fermented infusion of malt in large open vats, kept at a high temperature and in a current of air. Some wine refuse was usually added as a ferment. The improved modern, or German method, is to allow the liquid to trickle slowly over wood shavings, which are arranged in deep tubs on wooden diaphragms perforated with holes. By this means, a large surface at once being exposed to the air, which passes in a current through side holes near the bottom of the vessel, the fermenting liquid is very rapidly acetified. Vinegar thus made contains about 4 or 5 per cent. of pure Acetic Acid, along with some mucilaginous matters,—vegetable extractive, which gives it a dark colour,—and a peculiar ethereal product, upon which depend its characteristic flavour and odour.

Tests.—L. P.—Brownish; of a peculiar odour; Sp. Gr. 1·019; a fluid-ounce is saturated by ʒj. of crystallized Carb. Soda. If to the same measure be added ♏x. of solution of Chlor. Barium, the liquid then filtered, and more Chloride added, nothing further is precipitated. H S being added, its colour is not altered. (The Sulph. Baryta precipitated answers to the amount of Sulph. Acid, 1 part in 1000, which is allowed to be added by the excise laws. Much more than this is sometimes added.)

The E. P. gives as tests of its being sufficiently pure, that it has a Sp. Gr. of 1·006 to 1·019. Sulphuretted Hydrogen does not colour it; complete precipitation takes place in f℥iv. with *Sol. of Nitrate of Baryta* ♏xxx.

ACETUM GALLICUM, E. D. French or Wine Vinegar.

This is prepared abroad by allowing various wines to ferment spontaneously. It is rather stronger than the last, and is generally considered to have a finer aroma.

Wine Vinegar, according to the E. P., has a Sp. Gr. of 1·014 to 1·022. Ammonia in slight excess causes a purplish muddiness, and slowly a purplish precipitate. In f℥iv. complete precipitation takes place of all the Sul′ present with *Sol. of Nitrate of Baryta* ♏xxx. E.

ACETUM DESTILLATUM, L. E. Distilled Vinegar.

Prep. L. Take of *Vinegar* Cj. distil in a sand-bath Ovij.
E. Similar. Dilute the product, if necessary, with *Aq. dest.* till the Sp. Gr. is 1·005.

By distillation, the Colouring Matter, Sul′, and other impurities,

being left behind, the Vinegar becomes a colourless diluted Acetic Acid. With the Acid and water rises also the Spirituous substance, which characterizes all good Vinegar, and is the source of its peculiar aroma, that is, if the first part has not been unnecessarily rejected. The odour and taste of the distilled are less agreeable than that of good Vinegar.

L. The Sp. Gr. is 1·0065. f℥j. is saturated by 57 grains of crystallized Carb. of Soda. (It contains about 4·6 per cent. of real Acetic acid. The Sp. Gr. is lower than that of Vinegar, on account of the absence of mucilage, &c.)

E. 100 minims saturate grs. viij. Sp. Gr. 1·005. The Sp. Gr. of the L. distilled Vinegar is 1·007 or upwards, according to Dr. Christison. The E. C. order dilution because distilled Vinegar is often above 1·005.

Acidum Pyrolignеum, E. Diluted Acetic Acid, obtained by the destructive distillation of Wood.

Pyroligneous Acid is considered to be a discovery of Glauber; but it is probable, as stated by Berzelius, that it was known to the Egyptians, as may be inferred from a passage of Pliny, in which Pine wood, heated in a furnace, gives out " sudore, aquæ modo, fluit canali : hoc in Syria *cedrum* vocatur, ac tanta est vis, ut in Ægypto, corpora hominum defunctorum, eo perfusa, serventur." In the present day the distillation is usually conducted in iron cylinders, with condensers attached. The woody matter being decomposed by heat, its elements unite to form fresh compounds, and by distillation an acid liquor passes over with water, tarry matter, Empyreumatic Oil, and much inflammable gas, while a large proportion of excellent charcoal is left in the retort. The Pyroligneous Acid is a brown, transparent liquid, which consists essentially of Acetic Acid, diluted with water, holding in solution tar, with some Empyreumatic Oil, and having a smoky smell. It may be purified by distillation; or, by the addition of Carb. Soda, an Acetate of Soda may be formed,* which is to be used for making a purer Acetic or Pyroligneous Acid. This Acetate is purified by crystallization and re-solution, and then decomposed by Sul′: the Acetic′ set free is again distilled, and the processes repeated until a nearly colourless acid, with the odour of the Acetic, is produced. Purified Pyroligneous Acid, of density 1·048, constitutes the *Acidum Aceticum* of the L. P.

E. Nearly or entirely colourless; Sp. Gr. at least 1·034; ♏c. neutralize at least grs. liij. of Carb. of Soda; unaffected by Sulphuretted Hydrogen or sol. of Nitrate of Baryta.

Acidum Aceticum, L. E. D.

Acetic Acid, which is the basis of the foregoing acids, may be obtained in a concentrated state by decomposing an anhydrous Acetate, as that of Soda, with Sulphuric acid. When set free, being volatile, it may be distilled and condensed, and is readily recognized by its

* Sometimes Chalk is first added, and Acetate of Lime is formed, which is decomposed by digestion with Sulphate of Soda.

peculiar and grateful odour. It is limpid and colourless, acrid in taste, and will blister the skin, unless moderately diluted. It is exceedingly volatile, even at ordinary temperatures. Its vapour is inflammable. It may be crystallized at 60°, forming large colourless crystals, when it is called Glacial Acetic Acid. Pure Acetic acid is composed of $C_4H_3O_3$ $=Ac'$, with 1 Eq. of Water. Anhydrous Acetic Acid has lately been obtained by Gerhardt. It is supposed to be the ter-oxide of an organic radical called *Acetyle*, $C_4\ H_3$, which has been traced in a chain of substances which presents a striking similarity to the *Ethyle* series. Acetic Acid may be mixed in all proportions with water, Alcohol, and Ether. It dissolves Camphor, several Resins, and Volatile Oils, which therefore are frequently employed for aromatizing it. It forms numerous important salts, with metallic oxides, alkalis, and vegeto-alkalis. But the Acetates are decomposed by most of the acids, except the Carb'. An important fact, first investigated by Mr. Clark, which is referred to in the E. P., is, that the Sp. Gr. does not always bear an exact relation to the strength of the acid. The strength and the density go on increasing in a pretty uniform ratio till the latter arrives at 1·077; but as the strength increases still further, the density gradually sinks again to 1·063. Dr. Christison observes that the density is a tolerably correct measure of strength up to 1·062; and above this point it becomes equally so, on observing whether the addition of a small per-centage of water raises or lowers it. It may be here stated that 15 parts by weight of the London acid with 85 of water are equal in strength to distilled Vinegar. But the London acid is much weaker than the strong acids of the E. and D. P. The following are the strong Acetic acids of the pharmacopœias, arranged according to their strength, or the percentage of real Acetic acid which they contain.

Acidum Aceticum glaciale, D.	s. g. 1·065 :	85 per cent.
Acidum Aceticum, E.	s. g. 1·065 :	85 per cent.
Acidum Aceticum forte, D.	s. g. 1·066 :	51 per cent.
Acidum Aceticum, L.	s. g. 1·048 :	30·8 per cent.
Acidum Aceticum venale, D.	s. g. 1·044 :	28 per cent.

Next to these in strength is the Pyroligneous Acid of the E. P., of sp. gr. 1·034, containing about 21 per cent.

Prep. Acidum Aceticum glaciale, D., is prepared by exposing perfectly dried *Acetate of Lead* to the slowly disengaged and dry vapour of *Hydrochloric acid*, until the former appears damp throughout. The Acetic acid which is set free is then distilled off by means of a Chloride of Calcium bath and Liebig's condenser. The product is a tolerably pure hydrate of Acetic acid ($C_4H_3O_3$,HO). It tends to crystallize at all temperatures below 60°.

Acidum Aceticum, E., is made by distilling at a temperature of 320°, from a fusible-metal bath, dried *Acetate Lead* ℥vj. with *Pure Sulphuric acid* f℥ixß., in a glass matrass. The product is agitated with a little *Oxide of Lead* to remove any sulphurous acid. It is not quite so strong as the above acid, for the density is allowed to vary, as high as 1·0685. This density is increased by 20 per cent. of water. ♏c. should neutralize at least gr. ccxvj. of Carbonate of Soda.

Acidum Aceticum forte, D., contains nearly equal proportions of anhydrous Acetic acid and water. It is made by adding ℥vj. of the Glacial acid to distilled water f℥iv.

Acidum Aceticum, L. This is purified from the common acid obtained by the destructive distillation of wood. The impure Pyroligneous acid is formed into Acetate of Soda, as stated above; this is usually purified by several crystallizations; the product being distilled with Sulphuric acid, Acetic acid is condensed in the receiver, and Sulphate of Soda left behind; and finally, the acid may require one or more redistillations, to free it from empyreumatic matters, and reduce it to the proper density. "It is colourless; has a very pungent odour; Sp. Gr. 1·048; when heated it entirely evaporates. Nothing is thrown down on the addition of Nitrate of Silver or Chloride of Barium. (Tests for Hydrochloric and Sulphuric acids.) A piece of Silver-leaf being digested with it, and Hydrocloric acid afterwards dropped in, nothing is precipitated. (Pure Acetic acid will not dissolve Silver; but should any Nitric acid be present, some will be dissolved, and a precipitate subsequently occasioned by Hydrochloric acid.) No change of colour is produced on adding HS, or Ammonia, or Ferrocyanide of Potassium after the Ammonia. (Tests for the metals.) 100 grains of this acid are saturated by 87 grains of crystallized Carbonate of Soda."

Acidum Aceticum venale, D. This "Acetic Acid of commerce" is obtained from wood in the same way as the above, but it is not quite so strong as the other. Sp. Gr. 1·044.

Acidum Aceticum dilutum, L. D. Dilute Acetic Acid.

Prep. L. Mix *Acetic acid* f℥xxiij. with *dist. Water*, q. s., to fill up Oj.
D. Mix *Acetic acid of commerce* Oj. with dist. Water Ovij.

The dilute acid of the L. P. has a sp. gr. of 1·008. f℥j. is saturated by 57 gr. of cryst. Carb. Soda, and it contains 4·6 per cent. of real acid. It is therefore of the same strength as distilled Vinegar, for which it is intended as an equivalent.

The D. preparation has a sp. gr. of 1·006, and contains about 3·5 per cent. of absolute acid.

Action. Uses. Though so many forms are officinal, Acetic acid is not proportionally useful. The strong acid is one of the quickest Vesicants known, and an excellent escharotic for warts and corns. Acetum or Vinegar is used as a solvent for several vegetable principles, and is an excellent and grateful Refrigerant when applied externally as a lotion, or for sponging the body: its vapour when inhaled is useful in various affections of the throat and larynx. It is sometimes given internally, as in the *Syrupus Aceti*, E. *Good Vinegar* (French by preference) f℥xi. to *pure Sugar* f℥xiv., diluted, is a grateful form.

Acid. Aceticum Camphoratum, E. D. Camphorated Acetic Acid.

Prep. E. Pulverise *Camphor* ℥ß. with a little Rectified Spirit, and dissolve in *Acetic acid* f℥vjß.
D. ℥j. with *Sp. Rect.* f℥j.; dissolved in *strong Acet. acid* f℥x.

Action. Uses. Stimulant. Grateful in faintness, &c., but still more so in the form of the aromatised preparations of Acetic acid to which various volatile oils have been added.

CREASOTUM, L. D. Creazoton, E. An Oxy-Hydro-Carburet, prepared from Pyroxylic Oil, L.

This substance was discovered by Reichenbach in 1830 with several other compounds of Carbon, Hydrogen, and Oxygen, among the products of the destructive distillation of wood. It is found in Tar, in Pyroligneous acid, in wood-smoke, and in other substances which no doubt owe to it some of their properties. When pure, it is colourless and transparent, fluid, limpid like a volatile oil, of a powerful smoky odour, and a pungent burning taste. Its Sp. Gr., according to the L. P., is 1·046, but is stated by Dr. Christison to be 1·067. It is of high refractive power; when pure, unchanged by exposure to light; greatly expanded by heat; boils at 397°; burns with a sooty flame. It forms two compounds with water, one a Hydrate of 1 part of water to 10 of Creasote, and the other a solution of 1·25 parts of Creasote in 100 of water (*Phillips*). It is soluble in Alcohol, Ether, and Naphtha; in Acetic acid and in the alkaline solutions; but is neither acid nor alkaline. It is decomposed by Potassium, Nit′, and Sul′. Its most characteristic property is that of coagulating Albumen, and of preserving meat indefinitely, whence its name (from *κρέας*, *flesh*, and *σώζω*, *I preserve*).

Prep. It is obtained from Heavy Oil of Tar, or Pyroxylic Oil, which is derived, along with Pyroligneous acid, from the distillation of wood. This oil, which contains a great number of substances, is carefully distilled. The first and most volatile part which comes over is rejected : it contains a liquid called Eupion. The second denser portion contains the Creasote ; and as soon as a white crystalline material, called Paraffine, begins to come over, the distillation is stopped. The impure Creasote is separated from Acetic acid by agitating it with Carbonate of Potash, and redistilling, rejecting the first part that comes over. It is next freed from adherent Ammonia by shaking it with a solution of Phosphoric acid, and again distilling; Phosphate of Ammonia remains behind. It is now dissolved in a solution of caustic Potash, and separated from an insoluble oil which floats on the surface. The alkaline liquid is boiled, and becomes brown by the decomposition of some impurity. The Creasote is then separated by adding Sulphuric acid to neutralize the Potash. It may afterwards be purified by re-solution in Caustic Potash, again boiling, and again separating by acid; then finally washing with water, and distilling, separating the first portion, which contains water.

The formula of Creasote has not been well ascertained, but is supposed to be $C_{14} H_8 O_2$. As it is so difficult in preparation, it is often replaced in commerce by impure *Carbolic acid*, a substance which strikingly resembles it in its properties, but which, when pure, is a crystalline solid of a definite constitution. *Carbolic acid* constitutes the acid portion of the Volatile oil which is obtained by the distillation of Coal-tar. This Carbolic acid is supposed by Laurent to be really identical with Creasote.

Tests. L. It is colourless, has a peculiar odour, and is soluble in Acetic acid. Sp. Gr. 1·046. If dropped on bibulous paper, and heated for a short time to the boiling point of water, it disperses and leaves no translucent stain. E. Colourless, and remains so under

sunshine; Sp. Gr. 1·066; entirely soluble in its own volume of Acetic acid.

Action. Uses. Creasote, applied to the tongue, causes pain; on the skin, a burning sensation; and is fatal to small animals. It is useful in healing ulcers, and inducing a healthy action in cutaneous affections, in gangrene, and in scrofulous sores; given internally it acts as a sedative. It often gives great relief in toothache, and is extremely useful in allaying vomiting. (*Elliotson.*) The medicine should be well diluted, with at least ½ oz. of water to 1 drop.

MISTURA CREAZOTI, E. Mixture of Creasote.

Prep. Mix *Creasote* ♏xvij. with *Acetic acid* ♏xvj.; gradually add *Aq. dest.* f℥xiv., then *Comp. Spirit of Juniper* and *Syrup*, of each f℥j.

D. f℥j.—f℥ij.; each f℥j. containing ♏j. of Creasote.

UNGUENTUM CREASOTI, L. E. D. Creasote Ointment.

Prep. L. Rub *Creasote* f℥ß. with *Lard* ℥j.
E. f℥j. to ℥iij.
D. f℥j. to *Ointment of White Wax* ℥vij.

FOSSIL VEGETABLE PRODUCTS.

PETROLEUM, L. E. Bitumen liquidum nigricans e terrâ sponte manans, L. Petroleum. Barbadoes Tar. Rock Oil.

Petroleum, as its name indicates, is an oil-like exudation from rocks, which has been employed in medicine from the earliest times, though little used now. It is very abundantly diffused, and found in other forms, as of Asphalte, Naphtha, &c.

Besides in Barbadoes and Trinidad, Petroleum is found floating on some springs of water in this country, as at Colebrook Dale, &c., also in many parts of Europe, at Baku, on the shores of the Caspian, and very abundantly at Ranan-goong, or Earth-oil Creek, on the banks of the Irrawaddy. Col. Symes describes the wells as about 500 in number, and states that upwards of 400,000 hogsheads are annually taken away in boats. It may readily be obtained by digging into the sand in warm weather. This was examined by Drs. Christison and Gregory, who found in it Paraffine and Eupion, which Reichenbach met with among the products of the destructive distillation of wood; whence they infer that Rangoon Petroleum is the product of the destructive distillation of vegetable matter, probably from subterraneous causes now in operation.

Petroleum has the consistence of treacle; a reddish-brown or black colour, with a bituminous taste; floats on water, in which it is insoluble; and burns with a dense black smoke, leaving a carbonaceous residuum. Acids, alkalis, and Rectified Spirit have little effect on it; Ether, and Volatile and Fixed Oils, dissolve it. Exposed to the

air, it hardens into Asphalte; if submitted to heat, a yellowish-coloured liquid distils over, which resembles the Naphtha obtained in making Coal-gas. The term Naphtha is also applied to the thinner and more transparent varieties of Rock-oil. These are all more or less pure Hydrocarbons, free from Oxygen, and therefore used for preserving Potassium and dissolving Caoutchouc.

Action. Uses. Stimulant; has been recommended externally in Rheumatism and in Cutaneous affections; internally as a Vermifuge. The Rangoon is probably better than other kinds.

SUCCINUM. Amber.

Amber (*ἤλεκτρον*), with its property of attracting light bodies, was known to the Greeks; also to the Arabs, being their *kah roba* (grass-attractor). The term Electricity has been derived from its Greek name. It is no doubt a fossil product, usually washed up by the sea in different parts of the world. This country is supplied chiefly from the Baltic, it being cast on shore between Konigsberg and Memel. In India it is obtained both in Cutch and Assam. It is probably the resin of some Coniferous tree, as such wood is found in a fossil state. Insects and parts of plants are inclosed in amber found associated with Lignite beds. It is met with in irregular-shaped brittle pieces, of a yellowish or yellowish-red resinous appearance, translucent, devoid of taste and smell. It is not acted on by water or Alcohol. Subjected to distillation, it yields first a yellow liquid which contains Acetic acid, and afterwards a thin yellowish oil, with a yellow crystalline sublimate, which is Succinic acid ($C_8\,H_4\,O_6$, 2 H O). This acid, which resembles the fatty acids, may be purified by pressure in bibulous paper, and redistillation.

OLEUM SUCCINI, D. Oil of Amber.

Prep. Distil with a gradually increasing heat from *Amber in coarse powder* and *pure Sand,* of each 1 part, an acid liquor, an oil, and an acid in crystals. The oil may be detached from the acid liquor by filtering through bibulous paper.

Action. Uses. Succinic acid has been supposed to be Expectorant. The Oil is Stimulant and Antispasmodic in doses of ♏v. It used to be an ingredient of Tintura Ammoniæ Comp. (p. 65).

ANIMAL MATERIA MEDICA.

The animal creation, so interesting and essential an object of study for acquiring a scientific knowledge of the anatomy and physiology of the human frame, has become less important as connected with Materia Medica, since the progress of medicine has caused the disappearance from our books and practice of a crowd of inert and disgusting remedies, which could only have operated through the imagination ; while modern chemistry has shown that others can be obtained more easily and as pure from the mineral or vegetable kingdom. Thus Corals, burnt Oyster-shells, and Crabs-claws, were valuable on account of their being formed of Carbonate of Lime; burnt Bones on account of Animal Charcoal, and their ashes for Phosphate of Lime, yielded also by Cornu ustum; burnt Sponge for the salts of Iodine. Oils and fats in the animal kingdom are obtained of nearly the same nature essentially as vegetable oils and fats, as in the form of Lard or Suet. So Bees' Wax is like that of Palms and Myricas. Spermaceti contains a peculiar principle. These fatty matters continue to be retained, but chiefly as external applications. Saccharine matter is contained in Honey. Gelatine is obtained from Isinglass, also from Hartshorn, and even from Bones; Albumen from the White of the Egg; and Caseine from Milk, which also contains Butter and Whey. The peculiar secretions called Musk and Castor are still considered to possess some power in controlling a few nervous affections. The only animals which are officinal in their entire state are the Cochineal, for its colouring matter, Cantharides for their vesicating properties, and the Leech to draw blood.

I. CYCLO-NEURA *v.* RADIATA.

Class PORIFERA, *Grant.*

SPONGIA OFFICINALIS, *Linn.*, E. The Officinal Sponge.

Sponge is so well known for its economic uses, that it does not require a detailed description. Numerous species are known with soft porous bodies, traversed by tortuous canals ; but the officinal Sponge is imported from the Mediterranean and Red Seas. Some coarser kinds are obtained from the West Indies. Those of the British Seas would probably answer equally well for burning. When collected, Sponge contains numerous small fragments of corals and minute shells, from these it must be freed before it can be used for surgical purposes; for which it is well suited, from its soft and porous nature. Sponge *tents* are sometimes used for dilating sinuses. These are prepared by dipping strips of Sponge into wax, and as this melts by the heat of the body, the Sponge absorbs moisture, and swells ; or pieces of Sponge may be tightly wound with thread, which can

afterwards be cut. Sponge is composed of Gelatine and Coagulated Albumen. (*Hatchett.*) When burnt, its ashes consist of Carbon, some Silex, Carbonate and Phosphate of Lime, Carbonate of Soda, Chloride and Iodide of Sodium, Bromide of Magnesium, and a little Oxide of Iron. On account of the Iodine which it contains, *Burnt Sponge* was formerly much used in Goitre and Scrofulous affections. On the Continent some still prefer it to the preparations of Iodine. It is given in doses of ʒj. or more, along with Honey.

Class POLYPIFERA, *Grant.* The skeletons of Polypiferous animals, so well known by the name of Corals, were long officinal, as they still are on the Continent, and in the East. They owe their medical properties to Carbonate of Lime, with the addition of a little Oxide of Iron.

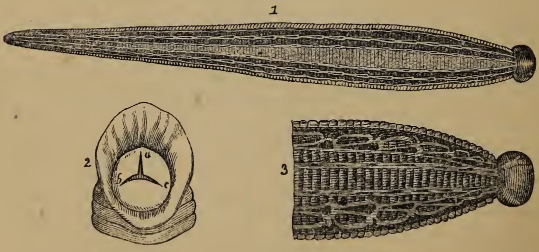
II. DIPLO-NEURA *v.* ARTICULATA.

Class ANNELIDA.

HIRUDO, L. D. Sanguisuga medicinalis, and S. officinalis, *Savigny*, L. *Hirudo*, Cuv., D.

Leeches and their effects must have been known from the earliest times. They were early employed therapeutically by the Hindoos, and the Arabs adopted their practice. (Royle, *Hindoo Med.* p. 38, and Wise on *Hindu Medicine*, p. 177.) Themison mentions the employment of Leeches by the ancients. Herodotus alludes to one kind (*Bdella nilotica*). Dr. Pereira infers that *Sanguisuga ægyptiaca*, the species from which the French soldiers in Egypt suffered, is that referred to in the Bible (Prov. xxx. 15) by the name of *Olukeh* or *Aluka.* The latter, or *Aluk*, is also the Arabic name for Leech.

Fig. 105.



Leeches are included by Cuvier in the genus *Hirudo.* This has since been subdivided into several genera. Savigny calls that which includes the leeches used in medicine SANGUISUGA, the *Iatrabdella* of Blainville. Leeches are characterised by having an elongated, plano-convex body, tapering towards both

extremities, wrinkled transversely, and composed of from 90 to 100 soft rings. The mouth is furnished with a lip, and the posterior extremity provided with a flattened disk, both adapted to fix upon bodies by suction, and to serve the leech as the principal organs of locomotion. Underneath the body two series of pores are observed, which lead to as many interior pouches, which are regarded as organs of respiration. The intestinal canal is straight, inflated from space to space, as far as two-thirds of its length, where there are two cæca. The blood swallowed is preserved there red and unchanged for many weeks. The subgenus *Sanguisuga* has the upper lip divided into several segments, the aperture of its mouth is tri-radiate, and it contains three jaws, each armed on its edge with two ranges of very fine teeth. Ten blackish points are observed on the head, which are taken for eyes. The anus is small, and placed on the dorsal surface of the last ring.

The two species most commonly used, and which by some are considered varieties of one another, are *Sanguisuga medicinalis* and *S. officinalis.*

S. OFFICINALIS is distinguished by its unspotted olive green belly and by the dark green back, along which and the flanks are observed six longitudinal, often interrupted rusty-red stripes. Six of the eyes are said by Savigny to be very prominent. Teeth about 70 in number. A native of the south of Europe, as of France and Germany. It is usually called the Green Leech, sometimes the Hungary Leech, from being a native of that country.

S. MEDICINALIS (fig. 105, 1 to 3), the kind usually employed here, is readily distinguished from the foregoing by its belly, which is of a yellowish green colour, but covered with black spots, which vary in number and size, forming almost the prevailing tint of the belly, the intervening spaces appearing like yellow spots. On the back are six longitudinal reddish or yellowish red bands, spotted with black and placed on an olive green or greenish brown ground. The number of rings varies from 93 to 108. Teeth 79 to 90 in number. A native of almost all parts of Europe, often called the English, the speckled, the true, the brown Leech, &c.

Other species are figured by Brandt, as *Hirudo provincialis*, *H. Verbana*, *H. obscura*, and *H. interrupta.* In the United States they use *H. decora.* In India, Leeches are extremely abundant, procurable both in the tanks of Bengal and in the north-west provinces, as well as along the foot of the Himalayas. Six kinds of useful and six venomous Leeches are mentioned in Susruta and by Avicenna, *l. c.* Many attempts have been made to rear the officinal leech artificially, but they have mostly failed. Those made by M. Soubeiran and others in the ponds in the neighbourhood of Paris were entirely frustrated by the *Oniscus aquaticus*, a small aquatic crustacean which preys upon the young leeches.

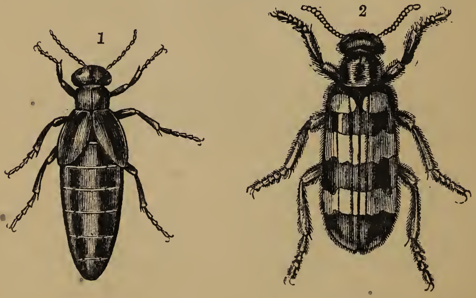
Uses. Leeches are effectual for the local abstraction of blood, affording indeed the best method in many cases, as in inflammation of the abdomen, scrotum, in hæmorrhoidal tumours, and prolapsus of the rectum. They may often follow general depletion; but, according to the quantity or the nature of the case, will themselves produce constitutional effects, especially in the cases of children. They act by a sawing motion, and draw each about ʒjß. of blood, though f℥ß. may be obtained by fomentation, &c. Excess of bleeding may be stopped by pressure, or the application of Matico; sometimes caustic is required, or even sewing up the wounds with a fine needle.

Class Insecta. Order *Coleoptera.*

Cantharis, L. E. D. Cantharis vesicatoria, *Latreille.* *Lytta.* The Blister Beetle. Spanish Flies.

The name *κανθαρις* was applied by the Greeks to a species of Coleopterous Insect which possessed the properties of the officinal Blistering Beetle, but it was distinguished by *yellow* transverse bands. This the characteristic of the species of Mylabris, one of which, *M. Fusseleni*, occurs in the south of Europe, and another, *M. Cichorii* (fig. 106, 2), in Syria, and apparently throughout the East. In India it is called *telee* and *telee mukhee*, or the Oily Fly, no doubt from the oil-like exudation which the insects of this genus give out from the articulations of their legs when seized. Another species, *M. Trianthemæ*, is mentioned by Dr. Fleming, and the *Lytta gigas*, Fab. is found there as well as in Senegal. One is mentioned by the Arabs under the name of *zurareh.* It is not known when the officinal Blistering Fly came to be used, but it has had a variety of names. It was called *Meloe vesicatorius* by Linnæus, *Lytta vesicatoria* by Fabricius—and *Cantharis vesicatoria*, by Geoffroy, a name adopted by the Pharmacopœias. Geoffroy grouped the Vesicatory Beetles in a small tribe corresponding nearly with the Linnæan genus Meloe, and distinguished it by the title Cantharideæ. This he divided into eleven genera, among which are the *Cantharis*, *Mylabris*, and *Meloe*, species of all of which have been employed as vesicatories. *Meloe majalis*, or Mayworm, is figured at fig. 106, 1, as a specimen of the genus.

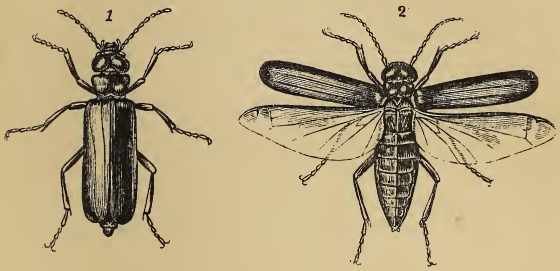
Fig. 106.



Cantharis vesicatoria (fig. 107, 1 and 2) is of an elongated, almost cylindrical form, from 6 to 10 lines in length by about 2 in breadth, the male somewhat smaller than the female. It is easily distinguished by its two beautiful elytra or wing-cases, which are long and flexible and of a shining golden green colour,

and cover two thin brownish membranous wings. The head is large and subcordate, with a longitudinal furrow along the head and the thorax : this is not larger than the head, rather quadrate. Its thorax chiefly, but also the rest of the body, covered with whitish grey hairs ; antennæ black, long, simple filiform. The maxillæ support the jointed palpæ, of which the terminal joint is somewhat ovate. The legs are from 4 to 6 lines long, smooth, 5 joints to the first pair of the tarsi, and 4 only to the last, all violaceous. Single spine on leg and notch in tarsus. The last joint of tarsus with a pair of claws, each of which is bifid. Near the anus of the female are two articulated caudal appendages, somewhat similar to palpi.—It abounds in the south of France, Spain and Italy; and it has spread into Germany and the south of Russia. It is found upon the Ash, Lilac, and Privet especially, but also upon the Elder and Honeysuckle, and more rarely on the Plum-tree, Rose, Willow, and Elm. M. Farines states, that the insects produced in warm places, and such as are exposed to the sun are most energetic.

Fig. 107.



Cantharides are stated not to live above eight or ten days. When alive, they exhale a strong, fœtid, and a penetrating odour, by which their presence is readily detected, and which is so offensive, that public walks sometimes become deserted until they have disappeared. They are usually caught early in the morning, when persons with covered hands and faces shake them off the trees, plunge them into vinegar, or expose them in sieves to the vapour of vinegar, and then dry them in the sun or in warmed apartments. They should be preserved in well stoppered bottles, as they are subject to be destroyed by other insects, introducing with them a little Alcohol, Petroleum, Camphor, Chloride of Lime (*Derheims*), or Pyroligneous acid (*M. Farines*), as it is preferable to employ fresh, well-dried, and smooth,—not dusty insects. They long preserve their form and colour, also to some extent the disagreeable odour of the living insect, and have an acrid burning taste. The powder is of a greyish-brown colour, interspersed with shining particles, which are the fragments of the elytra, head, and feet; though comparatively inert, these parts are very indestructible, and often serve to detect their presence in cases of poisoning.

Cantharides have been analyzed by Robiquet, and found to contain a *Green Oil*, a *Fatty Matter*, *Osmazome*, free *Acetic* and *Uric Acids*, and *Phosphates of Lime* and *Magnesia*,—with an active principle, called *Cantharidine*. This is intermediate in nature between volatile oils and resins. It crystallizes in white shining plates, fusing into a yellow oil, and volatilized by a higher temperature. It is soluble in ether, and in strong acids and alkalies. When isolated, it is insoluble in water and cold spirit, but these menstrua are enabled to dissolve it out of Cantharides by the aid of some other principles in the flies. Robiquet found that $\frac{1}{100}$th of a grain produced painful blistering of the surface. It volatilizes slowly even at low temperatures, and powerfully irritates the eyes of those who experiment upon it. Analyzed by Regnault, Cantharidine gave the formula $C_{10}H_6O_4$.

Action. Uses. Acrid Poison; Rubefacient and Irritant; Stimulant Diuretic; sometimes producing inflammation of the Urinary organs; but useful in smaller doses in inducing a healthy state of the mucous membrane in Chronic Gonorrhœa, Leucorrhœa, &c. Best known and most extensively employed for raising Blisters when applied to the skin, which it does in a space of from six to twelve hours, though sometimes with the disadvantage of producing painful Strangury.

TINCTURA CANTHARIDIS, L. E. D. Tincture of Cantharides.

Prep. L. D. Macerate for 7 days bruised *Cantharides* ℥ß. in *Proof Spirit* Oij. Strain.
E. Similar: or more conveniently by percolation.

Action. Uses. Stimulant Diuretic.

D. ♏x., but cautiously increased—fℨj. with some demulcent. Used internally in Gleet, Leucorrhœa, incontinence of Urine. With Soap or Camphor Liniment used as a Rubefacient in Rheumatism, &c.

ACETUM CANTHARIDIS, L. E. D. Vinegar of Cantharides.

Prep. L. Macerate for 8 days very finely powdered *Cantharides* ℥ij. in *Acetic acid* Oj., occasionally agitating. Express and filter.
E. *Euphorbium* is added, and more *Cantharides* used.
D. Twice as much *Cantharides* as L. P.

Action. Uses. Rubefacient and Epispastic. Useful as a powerful method of raising a blister; too strong and irritant for internal exhibition.

LINIMENTUM CANTHARIDIS, D. Liniment or Oil of Cantharides.

Prep. Digest finely powdered *Cantharides* ℥iij. in *Olive Oil* f℥xij. for 3 hours in a steam or water bath, and strain through flannel. Express the residuum, and strain the oil thus obtained. Finally, mix both products.

Action. Uses. May be used as a Rubefacient, or to produce a blister. Cantharidine is soluble in oil.

CERATUM CANTHARIDIS, L. Unguentum Canth., E. Cantharides Cerate or Ointment.

Prep. L. Melt *Spermaceti Cerate* ℥vj., add very finely powdered *Cantharides* ℥j. Mix.
E. *Cantharides* ℥j. to *Resinous Ointment* ℥vij.

Action. Uses. Irritant; employed to keep open blisters and issues. The active principle is dissolved in the fatty matter by the aid of heat, though too great heat will diminish the activity.

UNGUENTUM CANTHARIDIS, L. D. Ung. Infusi Canth., E.

Prep. L. Boil very finely powdered *Cantharides* ℥iij. in *Aq. dest.* f℥xij. down to one-half. Strain. To the filtered liquor mix in *Resin Cerate* ℔j. Evaporate to the proper consistence.
D. *Liniment of Cantharides* f℥viij. with *White Wax* ℥iij., and *Spermaceti* ℥j.
E. Infuse for one night powdered *Cantharides* ℥j. in boiling *Aq.* f℥v. Squeeze strongly, and filter the expressed liquid; add *Axunge* ℥ij.; boil till the water is dispersed. Then add *Bees' wax* and *Resin* āā ℥j. When liquid, remove the vessel from the fire; add *Venice Turpentine* ℥ij. Mix thoroughly.

Action. Uses. Irritant. Used as the Cerate; but is milder in its action.

EMPLASTRUM CANTHARIDIS, L. E. D. Blister Plaster.

Prep. L. Melt together *Lard* ℥vj., *Wax* and *Suet* āā ℥viiß., and add *Resin* ℥iij., previously melted. Remove from the fire, and when near concreting, sprinkle in very finely powdered *Cantharides* ℔j. and mix.
E. No *Lard.* The plaster also contains less *Cantharides,* and is too stiff.
D. Same strength as L.

Action. Uses. Vesicant: the most commonly employed application for raising blisters. In some cases the skin requires to be previously stimulated with an Embrocation or Sinapism, but generally the action is certain and complete.

EMPLASTRUM CANTHARIDIS COMPOSITUM, E. Compound Blister Plaster.

Prep. Melt *Bees' wax* ℥j. and *Burgundy Pitch* ℥iij.; add *Venice Turpentine* ℥ivß., and while hot sprinkle into it, finely powdered, and mixed, *Cantharides* ℥iij., *White Mustard Seed* and *Black Pepper* āā ʒij. and *Verdigris* ℥ß. Stir the whole briskly as it concretes on cooling.

Action. Uses. Powerful and Irritant Blistering Plaster; but seldom used.

EMPLASTRUM CALEFACIENS, D. Heating or Rubefacient Plaster.

Prep. Melt together *Emp. Cantharidis* ℔ß. and *Burgundy Pitch* ℔vß. Stir while cooling.

Used as a stimulant application to tumours and indolent sores.

Several substances have of late years been introduced as substitutes for Blistering Plaster, which are both elegant and efficient, under the names of *Tela vesicatoria, Blistering Tissue,* &c., and of

which other forms are the Parisian *Taffetas vesicant*, *Papier et Taffetas epispastique*. (*v.* Soubeiran, ii. p. 210). They are made with an ethereal or alcoholic Extract of Cantharides or solution of Cantharidine, mixed with resin or wax, and spread in a very fine layer upon these tissues, previously oiled or waxed.

Dr. Ættinger, of Bavaria, uses for such purposes a liquid called *Æther Cantharidalis*, formed by digesting 1 part of the Flies in 2 parts of Ether for 3 days. It contains, besides Cantharidine, a green oil and a waxy resin. Mr. Procter, of America, has found Chloroform to be the best of all the solvents for Cantharidine. *Æther Cantharidalis* mixed with an equal part of *Collodion*, forms an admirable drying blister for parts of the body where a more fluid application would be liable to run off. (Rapp.)

Order *Hemiptera*.

COCCUS, L. E. D. Coccus Cacti, *Linn.* The entire Insect. Cochineal.

Cochineal, so valuable as a dye, is of little importance in medicine. Several of the genus are used as dyes, as the Kermes insect, or *Coccus Ilicis*, found on the Ilex Oak; the *Coccus Lacca*, or Lac insect, found on various trees and shrubs in India, much used as a substitute for Cochineal, its Resin (Shell-Lac) being also employed for various purposes; and the *Coccus polonicus*, found on the roots of *Scleranthus perennis*. Something similar is found on the roots of a plant in the marshes of Herat. (*Burnes*). The true Cochineal or *grana fina* of the Spaniards, is found in the cool parts of Mexico, as near Oaxaca, whence one kind of Elemi is obtained. The *grana sylvestre*, an inferior species, is found in hot parts, as near Vera Cruz, and in Brazil. The female of the Cochineal insect is alone collected from off the Cactus plant, where the impregnated females have previously been placed by the natives of Mexico to produce their numerous young. These, when matured, are brushed off, and killed by artificial heat. Three harvests are annually collected. The *Silver* and *Black* varieties of the *Grana fina* are known. The insects are oblong, roundish, plano-convex, from one to two lines in length, wrinkled, the former of a colour resembling silver-paper, owing to a fine down with which they are covered, and by which the genuine may be distinguished from any imitation of the colour with powdered Talc, &c. They are of a purplish-grey colour, while the *black* variety is without bloom, and of a dark-reddish colour. An inferior kind (granilla), made up of smaller insects, and broken fragments, is also sold. Cochineal, when powdered, is of a carmine colour, without odour, but having a slightly-bitter taste. It contains some fatty matter, with a brilliant colouring principle, which has been called *Carminic acid*, and makes it valuable as a dye. It is used for giving colour to some tinctures.

TINCTURA COCCI CACTI, D. Tincture of Cochineal.

Prep. Macerate for 14 days *Cochineal* in fine powder ℥ij. in *Proof Spirit* Oj. Strain, express, and filter.

Used as a colouring ingredient.

SYRUPUS COCCI, L. Syrup of Cochineal.

Prep. Boil bruised *Cochineal* ℈iv. in *boiling dist. Water* Oj. for 15 minutes in a covered vessel, frequently stirring. Strain, and complete as with *Syrup. Altheæ*, adding *Sugar* ℔iij. and *Rect. Spirit* f℥iiß. or q. s.

Intended as a colouring addition to draughts and mixtures.

Order *Hymenoptera*, *Linn.*

APIS MELLIFICA, Linn., L. E. D. The Honey-Bee is officinal only on account of the Honey and Wax which it secretes or stores up.

MEL, L. E. D. Humor florum in favo depositus, despumatus, L. A Saccharine secretion, E. D. Honey.

Honey is secreted by the nectaries of flowers, and sucked by the Bee into its crop, where it undergoes some slight changes, and is then stored up in the comb. The finest Honey is that which is allowed to drain from thence; and, if obtained from hives which have never swarmed, it is called Virgin Honey. It partakes of the properties of the plants from which the bees have collected it. When of fine quality it is liquid and viscid, but translucent, having a fine, though peculiar odour, and a very sweet taste; but the best appears to some people slightly acrid, from an uneasiness experienced in the fauces. After a time honey becomes thick, white, and granular in texture. Inferior qualities are of a reddish-brown colour, granular, and intermixed with impurities, and are usually obtained by pressure of the comb. Honey is soluble in water, and a great part is taken up by boiling Alcohol. It is composed of crystallizable, with some uncrystallizable Sugar, a small proportion of Mannite, and a little aromatic principle. The inferior qualities contain Wax, some acid matter, and impurities. Diluted with water, it undergoes the Vinous fermentation, and Hydromel, or Mead, is produced. The Honey obtained from the comb (in favo depositus) is directed by the L. C. to be clarified by despumation. "If dissolved in water at about 170°, and, when cool, mixed with Iodide of Potassium and dilute Nitric acid, it exhibits no blue colour." This test is to guard against adulteration with starch or flour.

MEL DEPURATUM, D. Clarified Honey. Melt Honey in a water-bath, and strain while hot through flannel.

Action. Uses. Demulcent and slightly Laxative. Chiefly used in gargles, &c. It is a constituent of Oxymels, and of the Mel Boracis and Mel Rosæ.

OXYMEL, L. D.

Prep. L. Mix *Acetic acid* f℥vij., diluted with *dist. Water* ℥viij., with *Honey* ℔v., first made hot.
D. *Honey* ℔j. mixed with *commercial Acetic acid* f℥iij.

Action. Uses. Expectorant and Diaphoretic. D. ʒj.—℥ß. given in conjunction with other cough medicines.

CERA, L. Cera flava, E. D. Favus præparatus, L. A Waxy Secretion, E. D.

CERA ALBA, L. E. D. Idem dealbatus. Bleached Bees' Wax.

Wax, like Honey, has been known and employed from very ancient times. It is secreted in considerable quantities by various plants, as the Palms; by species of *Myrica*, especially at the Cape of Good Hope; and by less known plants in China and Japan. It used to be supposed that the Bee merely conveyed it from the plant; but it is now known that it is secreted by the Bee in glands situated on its abdominal scales, and thence collected by it for the construction of its cells.

CERA FLAVA. Yellow or Common Wax is obtained by subjecting the comb to division and expression to separate honey, melting the residue in boiling water, and keeping it hot for some time, to allow the impurities to separate or be dissolved. On cooling, the Wax concretes. It is melted again, and then strained, and sold in cakes. It is of a dull yellow colour, and has a peculiar, somewhat agreeable odour. By making it fall in a melted state, in small streams, upon a revolving wetted cylinder, it concretes in thin ribbon-like layers, which, being exposed for some time to the united influence of light, air, and moisture, become bleached, and of a yellowish-white colour. This is CERA ALBA. Spermaceti is often mixed with it to improve its colour; and Starch, Tallow, &c., occur as adulterations. Wax is firm in consistence, but melts at 155°; it burns with a bright light. It may be dissolved in boiling Alcohol and in Ether, but very readily in the Fixed and Volatile Oils. Resin and fat unite with it, and imperfect soaps are formed by its union with alkaline solutions. Dr. John found it to be composed of two principles, *Cerin* and *Myricin*. The former is separated by its solubility in Alcohol. Mr. Brodie has shown that this *Cerin* consists of a substance belonging to the chain of fatty acids, and called *Cerotic acid*, ($C_{54}H_{54}O_4$). *Myricin* is a more complex body. It consists of *Palmitic acid* ($C_{32}H_{32}O_4$) in combination with *Melissic Alcohol*, the hydrated oxide of a peculiar organic radical, *Melissyle* ($C_{60}H_{61}$).

Action. Uses. Demulcent; made into an emulsion, it is sometimes useful in sheathing abraded and irritable surfaces, as in Catarrh and Chronic Dysentery; but its chief value is for external application in the various forms of Cerates, Ointments, and Plasters.

CERATUM, L. Simple Cerate.

Prep. Melt *White Wax* ℥xx., and add to it *Olive Oil* Oj. Mix.

LINIMENTUM SIMPLEX, E. Simple Liniment.

Prep. With gentle heat dissolve *White Wax* 1 part, in *Olive Oil* 4 parts; agitate well, as the fused mass cools and concretes.

Action. Uses. The Cerate is used for Emollient dressings. The Liniment, for softening the skin, &c.

UNGUENTUM SIMPLEX, E. Simple Ointment.

Prep. Melt *White Wax* ℥ij. in *Olive Oil* f℥vß., and stir the mixture briskly while it concretes on cooling.

Action. Uses. A good simple dressing for sores.

UNGUENTUM CERÆ ALBÆ, D. White Wax Ointment.

Prep. Melt *White Wax* ℔j. with *Prepared Lard* ℔iv., and stir constantly while concreting.

Action. Uses. Made use of by the D. P. as a basis for many ointments.

EMPLASTRUM SIMPLEX, E. Wax Plaster.

Prep. Melt together with a moderate heat *Wax* ℥iij., *Suet* ℥ij., and *Resin* ℥ij. Stir briskly till the mixture concretes on cooling.

Action. Uses. Chiefly employed as a basis for other plasters.

III. MOLLUSCA.

Class CONCHIFERA, *Lamarck.*

OSTREA EDULIS, *Linn.* TESTÆ. The Shells of Oysters.

Oysters are well known as articles of diet. Immense quantities are dredged up on the coast of Kent, near Whitstable, and also on the opposite coast of Essex. The Shells were until lately officinal on account of the Carbonate of Lime, of which they are composed, with a small portion of the Phosphate, and a trace of animal matter.

Testæ preparatæ, prepared Oyster-shells, have been used as Antacid; but differ only from chalk in containing some Phosphate of Lime and various impurities.

IV. SPINI-CEREBRATA, *v.* VERTEBRATA.

Class Pisces.

Icthyocolla, a name derived from *ἰχθὺς* a fish, and *κόλλα* glue, is translated Isinglass, a word derived from the German *Hausenblase*, from *hausen* the great sturgeon, and *blase*, a bladder, being one of the coats of the swimming-bladder of Fishes, chiefly of the genus Acipenser or Sturgeon, and of which the best qualities are imported from the rivers of Russia, flowing into the Black and Caspian Seas, as well as from the Sea of Aral, and the Lake of Baikal. Isinglass is also imported from Brazil, and likewise from India. Of late the quality of this has been much improved. Isinglass is the purest known form of Animal Jelly; and it is therefore as Gelatine that it is valuable. Gelatine, when pure, is transparent, and nearly colourless, devoid of both taste and smell, easily preserved when in a dry state, but soon putrefying when moist. It is soluble in the different dilute acids, as well as in the fixed alkalis. Its solution forms with Tannin a copious precipitate, which smells like tanned leather. As Corrosive Sublimate does not precipitate Gelatine, it serves to distinguish it when in solution from Albumen. Gelatine unites with a large proportion of water, and a strong solution on cooling becomes a solid tremulous mass. By boiling with Sul′, it may be converted into a kind of Sugar, called *Glycocoll.* Isinglass in its purest form is white, semitransparent, devoid of smell or taste, softening in cold water, and dissolving in boiling water, with the exception of minute portions of earthy impurities. Bengal Isinglass, analysed by Mr. E. Solly, yielded, in three specimens respectively, 86·5, 90·9, and 92·8 per cent. of Gelatine. For the sources of Isinglass, *v.* Brandt and Ratzeburg's Medicinische Zoologie, Pereira's Elements of Materia Medica, and the Author's Pamphlet on the Production of Isinglass along the coasts of India, 1842.

Action. Uses. Demulcent. Used chiefly as a nutritious and non-irritating article of diet for the sick.

Morrhuæ Oleum, E. D. Gadus Morrhua. (Morrhua vulgaris, *Linn.*). Oleum e jecore comparatum. Oil obtained from the liver of the common Cod. *Oleum jecoris Aselli.* Cod-liver oil.

Though some fishes contain Oil generally diffused throughout their substance, in the Cod tribe it is mainly confined to the substance of the liver. The Oil obtained from the liver of the common Cod (the *Asellus* of Pliny, and of some modern naturalists) has long been in use as a popular remedy in Sweden and other parts of Northern Europe. In 1782 it was strongly recommended in England by Dr. Percival, as a remedy for chronic rheumatism; but it is only recently that it has been so extensively employed in scrofulous and consump-

tive cases, as to necessitate its formal introduction into the new pharmacopœias. The livers of some other fishes, nearly related to the Cod, as the Dorse, Burbot, and Ling, are supposed to yield a small part of the Cod-oil of commerce. This mostly comes from the coast of Newfoundland, where Cod-fish are so abundant.

Prep. There are two modes of extracting the oil. Sometimes a number of tubs are bored with holes at the bottom, and a layer of fir-twigs placed above them inside. The livers, being then removed from the fish, are piled in the tubs upon the twigs, and allowed to remain there for a considerable time, exposed to the sun and air. The substance of the livers gradually putrefies, allowing the oil to run out through the twigs into vessels placed below to receive it. Oil obtained in this way, unless afterwards purified, is apt to be brown, rancid, and nauseous.

The other mode of extraction consists in boiling the livers in an iron pot, and separating the oil by filtration and expression through a cloth. This plan is said to be adopted by the fishermen at Newhaven in Scotland. If water be not added, or the operation performed carelessly, the product may contain empyreumatic matters produced by the heat employed.

De Jongh describes three kinds of oil as found on the Continent. They also occur in English commerce. They differ in colour, being *Pale yellow*, *Pale brown*, and *Dark brown.* They have all a peculiar odour, a sub-acrid fishy taste, a feeble acid reaction, and sp. gr. about ·924. Cold Alcohol dissolves from 2—3 per cent. of the Oil; hot Alcohol from 3—7 per cent.; it is soluble in Ether in all proportions. The *Dark brown* Oil is more impure than the other kinds; its odour and taste are disagreeable and empyreumatic; and its sp. gr. may be as high as ·929. De Jongh has analysed these three kinds with great care, but he does not find them to differ materially in composition. In 100 parts of Pale Oil, he found the following constituents;—*Oleic acid*, along with a peculiar principle called *Gaduine*, 74; *Margaric acid*, 11·75; *Glycerine*, 10·17; *Butyric acid*, ·07; *Acetic acid*, ·04; various principles contained in *Bile*, about ·32; *Iodine*, ·037; *Chlorine* and *Bromine*, ·148; *Phosphorus*, ·021; with *Phosphoric* and *Sulphuric* acids, *Lime*, *Magnesia*, and *Soda*, each in small quantity, the *loss* being 3. The Brown oil contains less Oleic acid (69) than the above quantity. *Gaduine* has been analyzed by De Jongh, but was considered by Berzelius to be probably a modification of *Bili-fulvic acid*, one of the principles of Bile. Others have ascribed its presence to the decomposition of the oil, it being contained in larger quantity in the Brown oil.

According to the above results, Cod-oil would differ but little from many other oils, except in containing biliary matters. But the late researches of Dr. Winckler, though they appear to require confirmation, seem calculated to throw some additional light upon its chemical constitution. He states that Cod-liver Oil does not contain any true Glycerine, but, instead of it, an analogous substance called *Propyline*, or oxide of *Propyle*. When the oil is saponified with oxide of lead, this Propyline is oxidized into a peculiar strong-smelling substance,

Propylic acid, which forms a salt with the lead. Or if this oil be heated in a retort, with Potash, Lime, and Sal Ammoniac, a volatile liquid, *Propylamine*, ($N\,H_2, C_6H_7$), quite colourless, and with a strong, herring-like odour, may be distilled over. These results are not to be obtained with any other officinal oil. (Buchner's *Repertorium*, 1852.)

Tests. Though there are several tests which have been supposed to distinguish this oil, they are none of them very satisfactory. Many of its characters are common to all animal oils; and it is not clear that the late discovery of Winckler applies to this oil only. The biliary matters mark it as a liver-oil. And it is supposed by some to be peculiar in the proportion of Iodine it contains. Seal-oil and Whale-oil are sometimes substituted for it. Biliary matters, as ox-gall, have even been mixed with these to render the factitious sample more perfect. A mixture of Iodine with Olive Oil has been prescribed in France instead of the Cod-oil.

(1.) The first class of tests comprises those that determine it to be an *Animal Oil.* Its odour and taste, the considerable amount of ash left on incineration, and the Propylamine test of Winckler, will prove this. Or if Cod-oil be mixed with strong Sulph. acid, the purple mass treated with excess of caustic potash, and heated, a penetrating odour of the Oil of Rue will be disengaged. This *Oil of Rue* ($C_{20}H_{20}O_2$) may be formed by the abstraction of 2 equiv. of oxygen from *Capric acid*, a volatile fatty acid supposed to exist in all animal oils. (R. Wagner).

(2.) The next test is an indication of the presence of *Biliary matters.* Some strong Sulphuric acid being mixed with some of the oil placed on a white porcelain slab, a rich violet colour is produced, which passes into a brown. This result does not depend upon the small quantity of Iodine present, as was once supposed, but is caused by *Cholic acid*, and other constituents of the bile of the fish.

(3.) The presence of *Iodine* (not in a free state, but combined with fatty matters) is thought to be of importance. It exists also in the oils of other fishes, and of cetaceans. If free Iodine can be dissolved out by shaking the oil with Alcohol, or discovered by the starch test, it must have been added fraudulently. The Iodine naturally present cannot be detected by ordinary means. De Jongh recommends to saponify the oil, to separate the soap, carbonize it, and test the ash for Iodine. Rabourdin mixes 1 part of potash with 10 of oil, burns the soap produced, triturates the ash with water, and adds to the clear solution an excess of mixed Sulph. and Nit. acids. This being then shaken up with Chloroform, the latter dissolves out all the Iodine, and becomes of a violet colour. By comparing its colour with that of another chloroform-solution, containing a known proportion of Iodine, the quantity of Iodine in the oil is easily ascertained.

It is evident that none of these tests can be depended upon to detect adulteration with other oils.

Action. Uses. It has been supposed that the operation of this oil depends upon the presence of Iodine. This is probably an error. It cannot be replaced with advantage by any preparation of Iodine; nor has any other oil,—whether given alone, or mixed with Iodine or Ox-gall,—been extensively approved as a substitute; though many such trials have been made. It has been used in many cases of chronic disease, when attended with impairment of the nutritive functions. Thus it often proves useful in Skin diseases, in chronic Rheumatic and Gouty cases, in Scrofulous atrophy and affections of the bones and joints. In such disorders its use should be persevered in for some time. It has been found very serviceable in Pulmonary consumption, especially in the incipient stage, though it is also prescribed in advanced cases. In all of these disorders it is most appropriate when there is marked emaciation, and its beneficial result is shown by the fattening of the patient, by a slow alterative action, and improvement of the general health.

D. f℥ij.—f℥j. or ℥ij., three times a day. To overcome the nausea which is sometimes experienced, the purer and pale oils, which have a less disagreeable taste, should be preferred to other kinds. It may be floated on milk, some aromatic water, a bitter infusion, cold tea or coffee, or wine, according to the case and taste of the patient. It is generally advisable to persevere in its use for a considerable time.

Class Aves.

Gallus Bankiva, *var.* domesticus, *Temminck.* (*Phasianus Gallus*, Linn.) Ovum, E. D. Egg of the Domestic Hen. Ovi Albumen et Vitellus, L. Albumen of Egg. Yolk of Egg.

The common Fowl, domesticated everywhere, is probably derived from the Jungle Fowl of India. Its Egg is well known as a highly esteemed article of diet. The shell, consisting almost entirely of Carbonate of Lime, is seldom now employed. Within the shell, there is a white semi-opaque albuminous membrane, which contains the White of Egg, or *Albumen Ovi*, a glairy, viscid fluid, contained in very delicate membranous cells. The liquid may be considered a solution of Albumen, as it consists of 12 per cent. of this principle, with 85 of water, 2·7 of Mucus or uncoagulable matter, and 0·3 of saline substances, including Soda and traces of Sulphur. The glairy liquid is miscible with water, coagulated by heat under 212°, as in boiling an egg—also by acids. It then becomes white, opaque, and insoluble. The white of Egg is precipitated by Corrosive Sublimate, Diacetate of Lead, Protochloride of Tin, Tannin, &c.

The Yolk or Yelk, *Vitellus Ovi*, is a thick oily fluid, opaque, and yellow in colour, without odour, but with a bland and pleasant taste, forming a milky emulsion when agitated with water, and assisting to suspend in it many insoluble substances. It consists of Oil (which con-

tains much Elaine with a little Stearine) 28·75, Albumen 17·47, and water 53·8, with a little free Sulphur and Phosphorus in combination.

Action. Uses. The White of Egg is used chiefly for the clarification of watery liquids with the aid of heat, and of spirituous ones without heat. It may be used as an antidote in poisoning by Corrosive Sublimate and the salts of Copper. It is sometimes employed as an emollient application. Agitated with Alum it forms an astringent poultice. The Yolk, besides being nutritive, is extremely useful in pharmacy in making Emulsions, and suspending Oils, Oleo-resins, and Resins.

Class MAMMALIA, *Linn.*

Order CETACEA, *Linn.*

CETACEUM, L. E. D. Physeter macrocephalus, *Linn.* Concretum e materie oleosâ capitis comparatum, L. Cetine, nearly pure, E. A peculiar concrete substance obtained from the head, D. Spermaceti of the Sperm Whale or White Cachalot.

Spermaceti is found in peculiar cells situated in the great head of the above Whale, which inhabits the Pacific Ocean and China Sea. It is here mixed with Oil. Some also is contained in other parts, as the blubber. It is itself of the nature of a concrete fat. An oily substance is disposed in numerous cells situated in a great cavity along the upper jaw of the animal, which is separated from its blubber by a ligamentous covering, and supported by ligamentous partitions projected across, as fully described by John Hunter. The liquid contents of the head being taken out and boiled, on cooling, the Spermaceti concretes, while the valuable Oil swims, and is further separated by draining and pressure. Subsequent fusion and the action of a weak alkaline solution purifies the Spermaceti, which is then seen in beautiful white, pearly, crystalline masses, soft and slightly unctuous, with little odour or taste; Sp. Gr. 0·94; capable of being powdered with the addition of a little Spirit; melting at 112°; burning readily; insoluble in water, slightly soluble in Alcohol, more so in Ether, and readily in fixed and volatile oils. Spermaceti may be separated from any oil it contains by boiling Alcohol, which dissolves its pure principle.

The name *Cetin* has been applied to Spermaceti, when pure, and free from oil. It then melts at 120°. It resembles in its chemical nature the *Myricin* of Wax (q. v.). It is saponified with difficulty, when two substances are formed; one a neutral crystallizable fat, which can be sublimed, and has been called *Ethal;* and the other *Ethalic* acid, which approaches Margaric acid in nature. Ethal is also called *Cetylic Alcohol,* for it seems to be the hydrated oxide of a radical called *Cetyle* ($C_{32}H_{33}$). *Ethalic acid* is probably isomeric with Palmitic acid ($C_{32}H_{32}O_4$). It may be formed by the oxidation of the *Cetylic Alcohol.* (Brodie.)

Action. Uses. Emollient; formerly much given internally with Mucilage or yolk of Egg; now chiefly used externally in cerates and ointments.

CERATUM CETACEI, L. Ceratum Simplex, E. Spermaceti Cerate.

Prep. L. Melt together *Spermaceti* ℥ij. and *White Wax* ℥viij., and add them to *Olive Oil* Oj. Stir briskly while cooling.
E. Similar.

UNGUENTUM CETACEI, L. D. Spermaceti Ointment.

Prep. L. With gentle heat melt together *Spermaceti* ℥v., *White Wax* ℥xiv., and *Olive Oil* Oj. Stir well till cold.
D. *Spermaceti* ℔j., *Wax* ℔ß., *Lard* ℔iij.

Action. Uses. The Spermaceti Cerate and Ointment are both emollient dressings, the latter of softer consistence than the former.

Order RUMINANTIA, *Linn.*

OSSA, D. Bones obtained from the Ox,—Bos Taurus, *Linn.*

The bones of Mammals consist of Gelatine, and of about 60 per cent. of earthy matter, the greater portion of which is Phosphate of Lime, with about 1-5th of Carbonate of Lime, and small portions of other salts. This is obtained by burning away the gelatinous part in an open fire, and then powdering the earthy remains. These are used for making the Calcis Phosphas præcipitatum, D. and Sodæ Phosphas, L. E. D.

If bones are burnt in close vessels, *Carbo animalis*, E. D., (p. 56), or impure Animal Charcoal, is obtained, which consists of Charcoal and Phosphate of Lime. This is much used for purifying Sugar, the vegeto-alkalis, &c.

The Gelatine of Bones is not officinal, but it is often used dietetically in making nutritious soups. The earthy parts, being soluble in dilute Hydrochloric or Muriatic acid, are removed by digesting bones in such an acid solution, having first carefully cleaned them by boiling and scraping; and subsequently washing; the Gelatine is then boiled out, and flavoured, or with vegetable additions converted into soup. The diet of man, to be properly nutritious, requires to be of a mixed nature, and Bone Gelatine is as well suited as anything else to be one of its constituents, though, like other proximate principles, it will not suffice by itself.

CORNU, L. E. Cervus Elaphus, *Linn.* Horn and Horn-shavings of the Stag.

The antlers of the stag, or rather of the male called Hart, are known officinally as Hartshorn and Hartshorn-shavings. They are selected because they differ in chemical composition from common horn,

as of oxen, sheep, &c., which is analogous to coagulated Albumen. The antlers of the Stag, which are shed annually in spring, have the composition of Bone, that is, Gelatine 27, and Phosphate of Lime 57·5, with 1 part of Carb. of Lime. The Gelatine, however, is more soluble in boiling water than the Gelatine of bones. Subjected to destructive distillation, an impure Carbonate of Ammonia is obtained. This is so well known by the name of Spirit of Hartshorn that other preparations. not so obtained, are called by the same name. When burnt, Hartshorn yields ashes consisting almost entirely of Phosphate of Lime.

Action. Uses. Hartshorn shavings, boiled in water, yield a nutritious and colourless jelly, which may be used for the same purposes as that obtained from Isinglass or other sources. They are employed in the preparation of Pulv. Antim. comp., L. E.

MOSCHUS, L. E. D. Moschus moschiferus. *Linn.* Concretum in folliculo præputii repertum. Inspissated secretion in the follicles of the prepuce, E. D. Musk.

The Musk animal differs from common Ruminants, in the absence of horns, and in having long canine teeth on each side of the upper jaw. It inhabits the mountainous regions of central Asia, extending from the Himalayas to the Altai mountains, and from these to China. Hence, as in the case of Rhubarb from the same regions, we have Russian, China, and Indian Musk. It is singular that the common Hindoo name of the Musk, and in the Himalayas that of the Musk animal, is *kustooree*, a name similar to Castoreum, a substance which Musk so closely resembles in nature. The name *musk* is no doubt derived from the Arabic *mishk* or *mooshk*, which is evidently the same word as the Sanscrit *mooshka.* This has been used as a perfume and as a medicine by the Hindoos from very early times. It seems to have been adopted from the Hindoos by Serapion, but it was previously mentioned by Ætius.

The animal bears a close resemblance to the Deer tribe in shape and size. It is usually less than three feet in length, with the haunches somewhat more elevated than the shoulders. The want of horns and the projecting canines have already been mentioned. There are altogether 32 teeth : namely, 8 incisors in the lower jaw, 2 canines in the upper, and 24 molars. The canines are not met with in the female. The ears are long and narrow, and the tail very short. The fleece, which consists of strong, elastic, undulated hairs, varies in colour with the season, the age of the animal, and perhaps the place which it inhabits. The general colour is a deep iron grey. The individual hairs are whitish near the root, and fawn-coloured or blackish towards the tip. The gestation of the female was quite unknown until Mr. Hodgson in Nepal ascertained that it was about 170 days. They are extremely timid, mild, and gentle in their nature. Found on the tops of difficultly-accessible and generally open mountains, usually in the neighbourhood of the snow, but coming nearer to the plains according to the inclemency of the seasons, springing from rock to rock with great agility.

The Musk animal is particularly distinguished by the secretion in the males of the remarkably strong-smelling secretion called Musk, in a plano-convex, oval, hairy, bag, of which the opening is situated just before the præputial orifice. The sac is flat, smooth, and naked, above, where it is applied against the abdomen,—convex below, and hairy, —composed of several coats. The Musk is secreted by small, gland-like bodies, situated in little pits on the most internal of these coats. The quantity in each sac varies from $1\frac{1}{2}$ to 3 drachms. It is most abundant in the rutting season, and when fresh is soft, and of a reddish-brown colour. When dried, and contained in its native sacs, it forms the Musk of commerce. The kinds known are the Chinese and Siberian; the last is inferior in its fragrance to the other. The Chinese is probably from the same kind of cold and lofty region as the Himalayan. Some of this is imported into and apparently consumed in India.

Musk is in grains or lumps, soft and unctuous to the touch, of a reddish-brown colour, with a powerful, penetrating, and diffusive smell. The taste is bitter, disagreeable, and somewhat acrid; it is readily inflammable. Rectified Spirits and Ether are the best solvents of Musk. Analysed by different chemists, it has been found to contain Stearine, Elaine, Cholesterine, free Ammonia, various salts and animal principles, as Albumen, with an odoriferous principle which seems particularly attached to the Ammonia. This principle is in great part destroyed by heat, and cannot be separated from *Musk* by distillation. But the quantity and proportion of the constituents vary considerably, perhaps from the difficulty of obtaining specimens which have not been subjected either to abstractions or to additions.

Artificial Musk, said to be composed partly of a mixture of dried blood and ammonia, and sewed up in a piece of the skin of the Musk Ox, is extensively manufactured by the Chinese merchants at Canton.

Action. Uses. Stimulant, Antispasmodic, slightly Hypnotic. M. Trousseau considers it useful in some nervous affections, and states that it is Aphrodisiac. It may be given in 5-grain pills every three or four hours, increasing the dose to ℈j.

SEVUM, L. E. Fat of Ovis Aries, the Sheep. Suet.

The Sheep, domesticated from the earliest times, is supposed to be derived from *Ovis Argali*. Its flesh in the form of Mutton and Lamb is well known as a highly nutritious article of diet. The Suet or Fat, taken chiefly from near the kidneys, is alone officinal. It may be prepared for use by melting and straining. Suet is white, firm in consistence, brittle, with little smell, and of a bland taste. According to Chevreul, it consists of Stearine and Oleine, with Hircine and a little Margarine. The two first are abundant also in Lard. Hircine is a liquid like Oleine, but differs in being much more solu-

ble in Alcohol. Suet requires for its fusion a higher temperature (103°) than any other animal fat, owing to the large proportion of Stearine it contains. It is composed of Carbon, Hydrogen, and Oxygen.

Action. Uses. Emollient. Useful in giving consistence to ointments and plasters.

LAC. Milk is a peculiar liquid secreted by the mammæ of Mammiferous animals for the support of their young. That of the Cow is most commonly used in this country, though that of Goats and Asses is also employed, and that of Buffaloes and Camels in Eastern countries. It is remarkable that the milk of Carnivora is of the same general nature as that of the vegetable-feeders. Cows' milk, however, being that usually made use of as a demulcent, or as an antidote in cases of poisoning, and officinal for making the *Mistura Scammonii*, E., it will be sufficient to notice its constituents.

Milk is white, and appears homogeneous, but is in reality an emulsion composed of a transparent serous fluid, with numerous globules of fatty matter floating in it. When allowed to rest, these separate in the form of *Cream*, which, by agitation, pressing out the whole of the liquid (*Butter-milk*), and washing with water, is converted into *Butter*, which still retains some of the serous fluid. It is sometimes further purified by melting it, as in the case of the *clarified Butter* or *ghee* of India. Butter contains Stearine and Oleine, the proportions of which vary at different times. In addition to these it contains an odoriferous fatty principle, *Butyrine*, which has not yet been isolated, but yields on saponification four volatile fatty acids,—*Butyric*, *Caproic*, *Capric*, and *Caprylic*. There is also a yellow colouring matter. Milk is said to be *skimmed* when the cream has been removed, and will of itself become acid, when the clots termed *curds* separate from it. But if an acid or rennet be added, an albuminous substance separates, which is the basis of Cheese, and is called *Caseine*. This differs from the Albumen of Egg (p. 729) in not coagulating with heat. The residual serous fluid, or *Whey*, will on evaporation yield *Sugar of Milk*, *Lactic acid*, and other substances. The composition of Milk, according to M. Haidlen, is water 873, solid residue 127, Butter 30, Caseine and insoluble salts 51, Sugar and soluble salts 46. The salts are combinations of Phosphoric' with Lime, Magnesia, and Peroxide of Iron, Chloride of Sodium and Potassium,—and Soda in combination with Caseine. The Sp. Gr. of Milk varies from 1·030 to 1·035. When fresh, it has always an alkaline reaction, but soon becomes acid from the speedy conversion of its Sugar into Lactic acid. (*v.* Simon, *Animal Chemistry*, ii. p. 62.)

Action. Uses. Milk is nutritious as an article of diet, and useful as a Demulcent, as also in cases of acrid poisoning, as by Corrosive Sublimate, Sulphate of Copper, or Nitrate of Silver.

Order Pachydermata.

Adeps, L. Adeps præparatus. Adeps Suillus, D. Axungia, E. Fat of Sus Scrofa, *Linn.* The Hog. Hogs-lard.

The Hog is well known both in its wild and domesticated state. Its flesh was prohibited as an article of diet both to the Jews and Mahomedans. The fat about the loins, having greater consistence than that of other parts, is preferred for medical use; but that of the omentum and mesentery is also employed, as well as the subcutaneous fat. It is prepared much in the same way as Suet, but it should be kept stirred to prevent the separation of its constituents. That commonly sold contains salt, which renders it unfit for medical use, until it has been melted in boiling water to remove the salt. This process is directed in the D. P., and the purified Lard called *Adeps præparatus.* The L. C. directs that Lard prepared with salt is not to be used. But salt is not the only adulteration met with.

Lard is white, with little odour and taste, of a soft consistence, though granular in appearance; fusible at a temperature of from 80° to 90°; partially soluble in Alcohol, readily so in Ether and the volatile Oils; when fused, it assists the melting of Wax and Resins; it is converted into Soap by union with the alkalis. Exposed to the air it becomes rancid, that is, acrid in taste and disagreeable in odour. It is composed of Carbon 79, Hydrogen 11, and Oxygen 9 parts in the hundred, and of three proximate principles, Stearine and Margarine, amounting to 38, and Oleine, 62 per cent. These may be separated by the action of Alcohol, which deposits Stearine upon cooling as a white, concrete, and crystalline body, and yields the Oleine when evaporated. The Margarine may be separated from Stearine by being more soluble in cold Ether. Both also may be separated from Oleine by pressure or congelation.

Lard has lately been very extensively adulterated. Mr. Whipple has found more than 20 per cent. of farinaceous matter in some specimens. In *American Lard* (prepared in England) Mr. Crace Calvert has found, in addition to this starch, about 10 per cent. of water, 2·3 of Alum, and 1 of Lime. These materials are purposely mixed in by machinery, that by their opacity and by causing division of the fatty particles, they may render the lard whiter. These impurities should be tested for, before the lard is used for medicinal purposes.

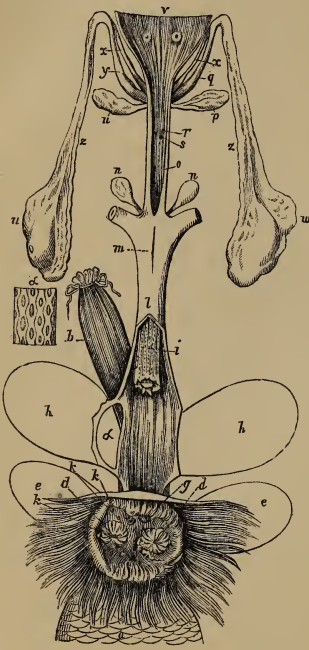
Action. Uses. Lard, like other fats, is Emollient, and used as a basis for various Cerates and Ointments. It is occasionally employed as an ingredient in laxative Enemata.

Order Rodentia.

Castoreum, L. E. D. Castor Fiber, *Linn.* Folliculi præputii proprio humore repleti, L. A peculiar secretion from the præputial follicles, E. D. Castor, from the Beaver.

Castor, a substance analogous in nature to Musk, has been employed in medicine from the time of Hippocrates. It is described by the Arabs under the head of *joond bedustur.* The description by Dioscorides leaves no doubt about the animal, which is so interesting and remarkable for its *building* habits in North America, though those of Northern Europe, from *burrowing*, are supposed to constitute distinct species; but Cuvier states, that after the most scrupulous comparison of the Beavers which burrow along the Rhone, the Danube, and the Weser, he has been unable to find any characters to distinguish them from those of North America. The Beaver is, particularly distinguished from other Rodentia by its nearly oval tail (*a*), which is flattened horizontally, and covered with scales. It is peculiar also in the Castor-sacs, which are found both in the male and female, and of which a detailed account is given by Brandt and Ratzeburg. From them the accompanying illustration has been copied, as the Castor-sacs (*h.h*) are often confounded with the testicles (*w w*), and their position is difficult to understand. They can be distinctly seen only on the removal of the skin of the abdomen. Besides these there are two others (*e. e.*), which are Oil-sacs. All

Fig. 91.



are situated between the pubic arch and the cloaca, a common hollow which is covered by a wrinkled hairy protuberance, into which open the Oil and Castor sacs, and the rectum (*b.*), and prepuce (*i.*) The Castor sacs are somewhat pear-shaped and compressed; they communicate by the same opening at their narrow extremities, but their fundi diverge. Like the musk-bags, these sacs have several coats; within all there is a convoluted mucous membrane, covered with scales, and a small brownish body, supposed to be a gland. The secreted matter, or Castor, in these sacs, is at first of a yellow-orange colour, but changes to a brownish colour as it becomes exposed to the air.

Two kinds of Castor are known in commerce: one American, imported by the Hudson's Bay Company, and the other Russian, which is very rare. This may be distinguished by a Tincture of 1-16th part in Alcohol being of the colour of deep Sherry; while that with the American Castor is of the colour of London Porter. The American, moreover, effervesces when dropped into an acid, which the Russian does not. (*Per.*) The sacs are usually united together by a part of the above excretory duct, and sometimes the oil-sacs may be seen with them. Internally they are divided into numerous cells, of which the membranes may be seen when the Castor is dissolved out; or when torn they may be seen intermixed with the Castor, which often breaks with a resinous fracture, and is of a reddish-brown colour. Its odour is strong, fœtid, heavy, its taste bitter and rather disagreeable. The chemical constituents, according to Brandes, are a volatile Oil, Resin, Ozmazome, Albumen, Mucus, Urate, Carbonate, Benzoate, Phosphate, and Sulphate of Lime, with Salts of Soda and Potash, some Carbonate of Ammonia, and a peculiar fatty substance, which crystallizes, and has been called Castorin. M. Wöhler has lately found in Castor two other ingredients, Carbonic acid and Salicine. This last is supposed to be derived from the bark of the Willow, upon which the beaver is known to feed. (P. J. xi. 200.)

Action. Uses. Moderate Stimulant and Antispasmodic. Mr. Alexander, as also M. Joerg and his pupils, having taken full doses of the Castor, experienced only eructations; but M. Trousseau has found it decidedly useful in many nervous and spasmodic affections, and in all its actions he considers it to resemble Valerian and Assafœtida rather than Musk. He recommends its union with Tincture of Assafœtida or of Aloes. It may be exhibited in powder or in pills in doses of ℈ß.—℈ij.

TINCTURA CASTOREI, L. E. Tincture of Castor.

Prep. L. Macerate for 7 days bruised *Castor* ℥ijß. in *Rect. Sp.* Oij. Strain. E. Similar. Prepare by digestion, or percolation, as Tinct. Cassia.

Action. Uses. Intended to be Antispasmodic, but is too weak a preparation.

TINCTURA CASTOREI AMMONIATA, E. Ammoniated Tincture of Castor.

Prep. Digest for 7 days in a well-closed vessel *bruised Castor* ℥ijß. and *Assafœtida* in fragments ʒx. in *Spirit of Ammonia* Oij. Strain and express strongly the residuum. Filter the liquor. Not conveniently prepared by percolation.

Action. Uses. Stimulant Antispasmodic in doses of fʒj.—fʒij. The Spirit of Ammonia is a good solvent, and both itself and the Assafœtida are useful in the same class of cases as the Castor.*

PHYSIOLOGICAL AND THERAPEUTICAL ARRANGEMENT OF THE MATERIA MEDICA.

The Author, in the Preface to the first edition of this work, observed, that the ultimate object of the accurate study of the articles of Materia Medica was, "the acquirement of a knowledge of the modes of Action and Uses of these several Drugs as Medicines, which was necessarily the most important part of the whole study. When students attended the course of Materia Medica and Therapeutics, in their first winter session, the Author found it most convenient to treat the former according to systems of Natural History; and then, towards the end of the course, grouped together all those Remedies which may be used for the same Therapeutical purposes." This he has also thought it desirable to do, as a conclusion to the present work—with a few general observations appended to each group. From these, the student will be the more easily able to recall to his memory the fact of so many of the remedies being relative agents, having their tendencies and effects controlled by external agents, or the varying states of the constitution. He regrets that he has been obliged to compress his materials within the compass of an Appendix to his Manual, though the subject, as he before stated, "would require a volume to itself—and to be treated in connexion with modern Physiology, Pathology, and Practice of Physic." Such a work he had hoped, before this, to have completed.

Classifications of Materia Medica are nearly as numerous as the authors who have written on it, and, to all, some objections may be made, from the very nature of the subject, in consequence of several remedies producing very different effects, and many diseases being curable by different methods of treatment. Many of the classifications have originated in the prevailing theories of disease; others

* *Hyraceum*, an animal product imported from the Cape of Good Hope in 1850, has been used as a substitute for Castoreum, over which it has the doubtful advantage of being still more loathsome. According to Dr. Pappe, it consists of the inspissated urine of the *Hyrax Capensis*. It is found in crevices and holes about the mountains where these animals resort, and is much valued by the native farmers, as an antispasmodic. The *Hyrax* has no peculiar gland, like that of the Beaver.

depend upon the obvious effects which medicines produce; while some have proceeded from inquiries respecting their mode of action in, or their tendency to particular organs or parts of the body. These inquiries resolve themselves into the two heads: 1. Of an examination of the medicines which are capable of producing changes; and, secondly, of the nature and properties of the being in which these changes are effected. The latter is the province of Physiology, a science which is so successfully prosecuted in the present day. This, and the improved knowledge of Animal Chemistry, have given a great value to the investigations of several modern observers. Some of the effects produced by the exhibition of medicines are of a temporary nature; such, for instance, as depend upon the cold or hot state in which they may be exhibited. These, however, soon give place to the phenomena which are due to the peculiar action of the medicine, and which may be of a *local* or of a *general* nature. Allowing this, discussions have occurred respecting the mode in which the effects of medicines are produced, whether by their acting only on the part to which they are applied, or by their absorption and circulation with the blood, and thus being carried to the part susceptible to their influence. Others have conceived, that the effects of medicines are due to their acting upon the nerves of the part to which they are applied, whence their action is propagated to remote parts by sympathy. But modern experimentalists have proved that most remedies are absorbed, and can be detected in the secretions—though some of the effects, perhaps all the effects of some medicines, may be due to nervous agency. Dr. Blake has shown that the rapidity of absorption and of the circulation are sufficiently great to account for the effects of the most rapidly acting medicines or poisons. M. Mialhe affirms—

"1. That a remedy must be absorbed, before it can exert any remote action on the animal economy.

"2. That the remedy must be soluble, or susceptible of becoming so, in the fluids of the living body, before it can be absorbed.

"3. That most remedies are subject to chemical changes during their passage through the animal system.

"4. That these changes are regulated by ordinary chemical laws, and that they may therefore be foretold, and even made available in the cure of disease."

If a medicine is soluble, and is not decomposed by the fluids of the alimentary canal, it is absorbed at once; but if it is insoluble, then it requires the intervention of the acids, alkalis, or saline compounds contained in the digestive fluids, in order to obtain an entrance into the circulation.

In this, the Metals, the greater number of the metallic oxides, and certain salts, are dissolved by the acids of the gastric juice.

The Metalloids, such as Sulphur and Phosphorus, the insoluble acids, certain insoluble salts, oils, resins, balsams, &c., are rendered soluble by the alkaline matters contained in the intestinal fluids.

Other insoluble salts, such as calomel, sulphate of lead, chloride of silver, &c., are acted on and dissolved by the alkaline chlorides, which are present throughout the whole course of the alimentary canal.

Much has been done by Wöhler, and others, on the Continent, and by Drs. Golding Bird and Bence Jones in this country. The whole question of the action of medicine is treated with great skill and ability by my friend, Mr. Headland, in his Prize Essay on the Action of Medicines, 1852.

Applied to the surface, conveyed into the interior, or absorbed into the circulation, medicines may produce their effects, either by their general *physical*, by their *chemical*, or by what has been called their *dynamical* properties, which probably means that they take place in the living body, and are, therefore, the *Vital Agents* of other authors.

Of these Vital Agents, some *stimulate*, or *excite*, others *depress*, and are called *sedatives*, or *contra-stimulants*. A third set produce some change in the solids or fluids of the body, and are named *Alterants* or *Alteratives*. The alterations which medicines produce in the structure or functions of organs are called their effects. Of these some are immediate, precede absorption, and being also capable of production in healthy individuals, are called *Physiological*, while those which they produce in curing diseases, are called their *Therapeutical* effects. The primary action of Medicines may, according to Barbier, be explained —1. By direct action on the organs which receive them. 2. By the medicinal particles being absorbed into the blood. 3. By sympathetic action. 4. By contiguity of organs, and, 5, By revulsion.

The mode in which these effects are produced, has been differently explained by different theorists. One of the oldest of these is what has been called the Humoral pathology, in which diseases are supposed to be cured by the system getting rid of some peccant humour. The Hippocratic maxim is, that contraries are to be cured by contraries—but the fanciful idea of a modern theorist is, that cures are to be made by medicines which can produce effects similar to the symptoms of the disease. According to the Brunonian theory, all medicines are stimulant, and differ from each other only in degree. They are supposed "to cause exhaustion, by producing previous over-excitement." The modern Italian doctrine, or that of contra-stimulus, admits two classes of medicines, that of Stimulants, and of Contra-Stimulants, or Sedatives, to be employed respectively against asthenic and sthenic disorders. Broussais admitted Stimulants and Debilitants, but particularly called attention to the Revulsive action of medicines, by which determination was induced from the seat of disease to the part affected by the medicinal action. Mr. Headland has well observed, that " none of these ideas being by itself perfect, the sounder reasoners of the present day are driven to suppose, that there are various different ways in which medicines may *counteract*, and thus cure, different diseases. This *counter*-action is different from contrary action;

may be direct or indirect; and it allows of any action in a medicine, tending to restore health, except an effect similar to the disease."

Classifications of Materia Medica have been made according to their Physiological action, and a few according to their Therapeutical effects. But most authors have preferred—probably as best suited to the state of knowledge, and, upon the whole as most useful, classifications founded upon the obvious general results, or ultimate effects of medicines. Dr. Cullen made a distinction of medicines as acting upon the Solids, or upon the Fluids of the body. Dr. Young introduced Chemical agents, but arranged the greater number of remedies under the head of Vital Agents; and ranked Specifics as Insensible Agents. Dr. Murray divided the several groups of medicines into the four heads of General Stimulants, Local Stimulants, that is, Evacuants, Chemical Agents, and Mechanical Agents. Dr. M. makes the mistake of including Sedatives with Narcotics, under one head with Stimulants. He was followed by Dr. Duncan, who makes five great divisions. Aliments used as Medicines, Evacuants, Stimulants, Depressents, and Chemical Agents. Dr. A. T. Thomson and Dr. Paris have adopted Dr. Murray's Mechanical and Chemical Agents, along with Dr. Young's Vital Agents. The additions which have been made have contributed to make these arrangements clear and sufficiently comprehensive: the author has adopted them as being useful for practical purposes. In these improved arrangements, we find that reference is made to the local tendencies of medicines. For instance, Evacuants have been mentioned by Dr. Murray as Local Stimulants, or those which act locally on glands. Dr. Thomson has divided his Vital Remedies into those which act on the nervous system, on the secerning system, and into those which act on the muscular and sanguiferous systems. Some classifications have been formed from these local tendencies of medicines — as, for instance, that of Dr. Pereira, who after three classes of external agents, names his fourth class Hæmatica, or blood-medicines, among which he places Acids, Alkalis, and Alteratives. In Class v., Pneumatica; Cl. vi., Neurotica; Cl. vii., Cœliaca; Cl. viii., Eccritica; Cl. ix., Genetica. Mr. Headland's classification is based on the same general principle of the tendencies of medicines, and consists of the following classes and divisions. Class i., Hæmatics. Div. 1. Restoratives; 2. Catalytics. Cl. ii., Neurotics. Div. 1. Stimulants; 2. Narcotics; 3. Sedatives. Cl. iii., Astringents. Class iv., Eliminatives. (Essay on the Action of Medicines on the System.)

The investigations of the present day into the true action of medicines will, no doubt, greatly improve our physiological knowledge, and, consequently, all such classifications. But, in the meantime, we continue to make use of the arrangements founded on the general nature of the effects of medicines, and though we have made use also of the principal divisions under which the groups are arranged, it is evident that some of these indicate but indifferently the whole of the

effects produced by the medicines arranged under them. Thus, the groups of Remedies arranged under the head of Mechanical, are chiefly articles of diet used medicinally, and, though a portion of their effects may be due to their physical properties, others must depend upon their being digested and absorbed into the system. So of the Chemical Remedies, a portion of their effects are no doubt due to their agency as such, even after they have been absorbed into the blood or carried into the secretions, but a great part, also, to their acting on the fluids and solids of a living body. This primary chemical action is, however, not confined to the groups arranged under that division, but participated in by those called, more especially, Vital Agents—for some of the effects of the Alteratives, as well as of some of the Tonics, is probably of a chemical nature, after their absorption into the blood. Hence they form the Hæmatics of some of the above classifications. A part, also, of the effects produced by some of the Evacuants are due to chemical action, but it is, for many reasons, convenient to keep them all together. The chief effect of Tonics, as well as of Stimulants, is generally considered to depend upon their action on the nervous system, but by some as acting upon the muscular and sanguineous systems, though no doubt ferruginous preparations at least also act chemically. The true Stimulants, however, as well as the Narcotics and Sedatives, act chiefly upon the nervous system, but this does not exclude their also acting on the muscular and vascular systems.

A. Mechanical Remedies.

Diluents. Demulcents. Emollients.

B. Chemical Remedies.

Escharotics. Acids. Alkalis. Antilithics.
Disinfectants. Astringents. Antidotes.

C. Vital Agents.

1. *Evacuants or Local Stimulants.*

Alteratives. Errhines. Sialogogues. Emetics. Expectorants.
Diaphoretics. Diuretics. Cathartics. Anthelmintics.
Emmenagogues. Rubefacients. *Counter-Irritants. Vesicants.*

2. *General Stimulants.*

Tonics. Stimulants and Aromatics. Diffusible and Special Stimulants.

3. *Depressents or Contra-Stimulants.*

Narcotics. Antispasmodics. Refrigerants. Sedatives.

A. Mechanical Remedies.

The groups of medicinal agents ranged under this head are supposed to act only as ordinary physical agents, or by their simple mechanical properties, and are therefore considered in general to be of little importance. But as numerous cases occur in which we require by dilution to diminish the acridity of a secretion or to increase the solvent powers of an excretion, to sheathe an irritated canal, or to protect an abraded surface, so we must have recourse to the milder class of remedies, which are as well suited for such purposes as the more powerful are for the graver states of disease.

Diluents.

The term Diluents is applied to such remedies as are supposed to increase the fluidity of the blood, but as most of these are Demulcents, dissolved in large quantities of water, it is to this fluid that they owe any efficacy which they possess. Dr. Cullen applied the term of Attenuants to such remedies as had the power of diminishing the cohesion of parts. The general effect of Diluents is to allay thirst and to diminish heat of skin, promote transpiration from the skin, as well as to increase the flow of urine. The greater or less dilution will influence, moreover, the action of other remedies. The small quantity of nutritious matter will be easily digested and the water quickly excreted. This, if pure, cannot fail to be useful as a solvent, and in the elimination of effete matters. To such action must be ascribed much of the beneficial effects produced on patients who resort to "watering-places," and who drink large quantities of water, taking at the same time much exercise in the open air.

If the imbibition of water have the effect of increasing the fluidity of the blood, abstinence from this fluid ought to have the effect of rendering it more dense. This forms what is called dry diet, or *dry treatment*, as recommended by Dr. Williams for the cure of coryza, &c.

Aqua. Distilled Water.	Rice Water.
Rain or pure Spring Water.	Thin Gruel.
Toast and Water.	Whey, as in the "Whey cure."
Barley Water.	Much diluted Demulcents, &c.

Demulcents.

Demulcents, as their name indicates, include such substances as are calculated to soften and lubricate the parts to which they are applied. Though having the same signification as the word Emollients, it seems desirable to restrict the latter term to such as are intended for external application, and to apply the name of Demul-

cents to such as are intended for internal exhibition. We therefore retain in a separate group the mucilaginous, starchy, saccharine, oily, and gelatinous substances which, devoid of odour, mostly with little taste, and which when dissolved or suspended in water, form a viscid solution or mixture. These are found useful in softening any preternaturally hard or dry part, in sheathing any abraded, and in allaying the irritation of any inflamed part. This they effect by rendering parts less sensible to the influence of even ordinary secretions, or by involving acrid matters in a viscid medium. They may even allay pain, when this depends on the tension and irritation of solid parts. Though the primary action is of a mechanical nature, the subsequent effects are due to vital agency. Like Diluents, they will diminish thirst, internal heat or irritation, and thus be useful in coughs and other pulmonary affections, in irritation or inflammation of the fauces, gastro-intestinal membrane or urinary organs; and the more such organs are irritated, the greater often is the soothing influence which is experienced.

If long continued, they may prove too relaxing, and consequently debilitating, but being more or less nutritive, and most of them readily digested as well as unirritating, they are frequently employed as articles of diet for the sick and convalescent. They may therefore be arranged according to the nature of their proximate principles, as this will serve at the same time to give a general idea of the articles of diet, of most of which water (*v.* Diluents) forms a large proportion, besides being employed to quench thirst. A few saline substances also form a constituent of most articles of diet.

The first group of these Demulcents, many of which are also *Articles of Diet*, includes the vegetable proximate principles enumerated at p. 269, and which, with Carbon, contain Oxygen and Hydrogen in the same proportions as Water, and are sometimes called Hydrates of Carbon.

Mucilaginous.—This includes plants containing mucilage and the different kinds of gum, which when infused in water form mucilaginous solutions; as

Malva.
Althæa. Syrup. et Mist.
Inf. Lini comp.
Cydoniæ Decoct.
Pate de Guimauve.
Acaciæ Gummi. Mucilago. Mistura E. Trochisci.
Tragacantha. Mucilago et Pulv. comp. with Starch and Sugar.

Amylaceous.—These consist of the different kinds of Fecula or Starch, which require to be acted on by boiling water, when the external lamina is burst, and the inclosed amidine becomes dissolved and forms a bland unirritating solution. Chemical Physiologists infer that it is rendered soluble by the Pepsine of the Gastric juice; when being converted first into Dextrine, then into Glucose or Grape Sugar, it is absorbed by the capillaries of the veins.

Amylum.
Arrowroot.
Tous les Mois.
Sago.
Tapioca.
Rice Starch.
Potato Starch, &c.

The Cereals also contain Starch, but mixed with other principles, as in Tritici Farina, Avena, Hordeum, Rice and Maize.

Saccharine.—This term, especially applicable to sugar and other sweet tasted substances, is sometimes made to embrace also the two preceding groups, as being nearly identical in chemical composition, and similar in physiological action.

Saccharum.
Syrupus.
Mel.
Glycyrrhiza Decoct., Ext. and Troch.
Uvæ passæ.
Fici.

The Mucilaginous, Amylaceous and Saccharine groups are supposed to be useful, as articles of diet, in promoting the formation of adipose tissue, but chiefly in being converted into Glucose, then into Lactic', finally into Carbonic acid, and thus, with the oleaginous substances, forming, according to Liebig, the elements of respiration.

Oleaginous.—These are also ternary compounds of Oxygen, Hydrogen, and Carbon, but the Hydrogen here is greatly in excess. Most have a great affinity for Oxygen. They contain two or three different principles, as *oleine* or *elaine*, which is fluid, with margarine and stearine, which are solid. As medicines they are usually made into emulsions with Gum Arabic, Tragacanth, or Yolk of Egg. As articles of diet they are absorbed by the lacteals, and besides promoting the formation of adipose tissues, are considered also to become oxidized in the system, and thus, like the preceding carbonaceous groups, to support animal heat. They are hence called calorifacients.

Vegetable Oils.
Ol. Olivæ.
Ol. Papaveris.
Ol. Amygdalæ.
Animal Fats.
Adeps.
Cetaceum.
Cera.

Gelatinous and Albuminous include all the substances which are also called nitrogenous, from having Nitrogen as a constituent, as well as Oxygen, Hydrogen, and Carbon. Some of these, though in small quantities, are also contained in vegetables, as in the gluten of wheat, in almonds, pulses, &c.; in fact, vegetable albumen is very similar in composition to fibrine. Liebig has ingeniously distinguished these as the plastic elements of nutrition, that is, vegetable albumen, fibrine and caseine, as well as animal flesh and blood, all which are rendered soluble by the action of the acid of the gastric juice and pepsine.

Gelatinous—Formed of Gelatine or Jelly dissolved in water:—
Isinglass. Hartshorn Shavings. Calves' Feet, &c.

Albuminous—Coagulated by acids and the action of boiling water:—
White and Yolk of Egg. Milk.

Emollients.

Emollients, as their name indicates, from "emollire," to soften, are medicines calculated to soften the tissues with which they are

brought into contact. As it seems convenient to retain the term for such as are intended for external application, and that of Demulcents for internal remedies, so Emollients may include the Expressed Oils, Liniments and Embrocations, with many Cerates and Ointments, as well as the majority of Cataplasms and Fomentations. The effects of these, as well as of the other Emollients, is to soften and to diminish the tone of parts to which they are applied. Some, it is supposed, by insinuating their particles into the substance or tissue of the part or organ, serve to relax and to render these more supple. Though a portion, therefore, of the effects may be due to absorption, it has also been inferred, from the rapidity of the relief which is sometimes experienced, and more or less deeply, from warm and moist applications, that something may be due to contiguous sympathy.

Moist Heat, as from the use of warm Water or Fomentations.
Papaveris Dec.
Malvæ Dec. comp. with Chamomile.
Anthemidis Inf. and Dec.
Cataplasms with Althæa, Mallow, or Verbascum.
Bread and Milk poultice.
Dauci Radix.
Cataplasma Lini.
Cataplasma simplex, with Figs.
Papaveris Oleum.
Lini Oleum.
Amygdalæ Oleum
Olivæ Oleum.
Cacao Butyrum.
Myristicæ Oleum expressum.
Palm Oil.
Sevum vel Adeps ovillus.
Adeps suillus.
Cetaceum, Cer. et Ung.
Cera alba et flava. Ceratum. Lin. et Emp.
Sapo. Linim. Saponis with Camph. and Sp. of Rosemary.
Lin. Saponis c. opio.
Emp. Saponis et Emp. comp.

Applications to Burns:—

Cotton. Linim. Calcis.

ANTHELMINTICS mechanical, *v.* p. 768.

B. CHEMICAL REMEDIES.

This division holds a place in the arrangements of Murray, Duncan, and Thomson, and includes those remedies which seem to act chiefly by producing chemical changes in the solids or fluids of the body. By the last named author, they are divided into those which act on the surface or on the contents of cavities, or change the state of the air. But though many chemical affinities seem to be controlled when brought within the influence of vital agencies, yet modern physiological chemists have shown that the influence of remedies, acting, in a great measure according to chemical laws, extends much beyond what was formerly admitted. Mialhe, indeed, so long ago as the year 1841, stated that he would one day demonstrate by experiment,—"That for an internal remedy to have a general action on the organism, it must be soluble, or susceptible of becoming so, by reason of chemical changes taking place in the interior of our organs."—See above and his "L'Art de Formuler." But as it is now difficult to procure this work, see "Brit. and For. Medico-Chir. Rev.," vol. iv.

p. 128. But as space cannot be spared for entering on this subject, some of the results obtained by different observers, will be given under the head of the separate groups which come under this division.

Escharotica. Caustica.

Escharotics (from ἐσχαρέω, to form an eschar), usually called Caustics, are employed for destroying the vitality of the part to which they are applied. They are occasionally called *Potential Cauteries*, to distinguish them from the Actual Cautery, or great heat applied through the medium of heated metal, or of Moxa, used for the same purpose. Concentrated acids and alkalis destroy the vitality of a part by forming a chemical union with one or more of the constituents of the animal body, from which some of them may afterwards be separated by presenting to them agents which have greater affinities for the solvent.

Mialhe distinguishes as *Coagulating Caustics* those which, by combining with the tissues of the body, form insoluble compounds, such as the mineral acids, the chlorides of antimony, of zinc, and of gold, the bichloride of mercury, the nitrates of silver and of mercury, the sulphate and acetate of copper, creasote; while those which produce soft and gelatiniform compounds, he calls fluidifying caustics, which are equivalent to the liquefacients of Dr. Pereira, as the solutions of potash, of soda, and of ammonia, arsenious acid, hydrated phosphoric acid, oxalic acid, &c. The strong acids and alkalis have the disadvantage of being in a liquid form, and thus spreading beyond the part to which they are applied, though they have in other cases the advantage of following a poison into all the sinuosities of a wound. Dr. Bennett, in his work on the inflammation, &c., of the neck of the uterus, finds the nitrate of silver most useful, though less energetic; and the *Potassa cum calce*, as made into cylinders by Mr. Squire, both powerful and manageable. Of the acid caustics he prefers the Pernitrate of Mercury, though it has the disadvantage of being apt to spread. To the list of caustics are added a few which are milder in their action, and which are useful in producing a healthy stimulant action in ulcers, &c.

Acids—Sulphuric, Nitric, and Acetic.
Arsenious Acid: sometimes used in cancer.
Pernitrate of Mercury.
Potassæ Liquor.
Potassæ Hydras.
Potassa cum Calce.
Potassæ Carbonas.
Calx recens usta.
Calcis Hydras.
Ammoniæ Liq. fortior.
Alumen exsiccatum.
Tinct. Ferri Sesquichloridi.
Zinci Chloridum.
Liq. Antimonii Sesquichloridi.
Argenti Nitras.
Cupri Sulphas.
Cupri Diacetas.
Linim. Æruginis.
Ung. Æruginis.
Cupri Ammonio-Sulphas.
Hydrargyri Oxydum (Black Wash).
Hydrargyri Binoxydum (Yellow Wash).
Hyd. Nitrico-Oxydum et Ung.
Hydrargyri Bichloridum.
Hydr. Biniodidum.
Ung. Hydrarg. Nitratis.

Acida. *Acidulæ.*

Acids have long been ranked among chemical remedies, their mode of action when employed as medicines being in many instances obviously the same as when acting out of the body. Acids in a concentrated state, it is well known, act as Escharotics, from the strong attraction for some of the constituents of animal structure. But when moderately diluted this is not so obvious, for when applied to the skin or other mucous membrane, a pungent sensation, accompanied with some astriction, is experienced, and the blood is repelled from the capillaries. These effects are often followed by stimulant reaction. So, taken internally, they dissolve the epithelium scales, and act as corrosive poisons, but when much diluted, a sensation of coolness, though when less diluted, a tonic effect is experienced. But such powerful agents cannot come in contact with the solids and fluids of the body without producing some chemical effects. In the stomach and upper part of the intestinal canal, they will meet with an acid state of the secretions, and becoming absorbed into the blood, they must enter into combination, for this fluid does not lose its alkaline character. In the alimentary canal they will neutralise the naturally alkaline state of the secretions, in either case depriving the system of alkaline matter, and forming salts which are for the most part excreted in the urine: in some cases rendering this acid, but it is well known that this secretion is more readily affected by alkalis than by acids, and a considerable difference has been observed between the vegetable and the mineral acids. The latter, with the exception of the phosphoric, when diluted forming insoluble compounds with albumen and fibrine by coagulating albumen. The vegetable acids, though they equally rob the system of alkaline matter, and some become partially oxydized, yet they usually reappear in the urine as super salts; dilute acetic, oxalic, and tartaric acids dissolve the capsules of the mucous corpuscles. In late experiments it has been found more easy to acidify the urine with the vegetable than with the mineral acids. Vegetable acids combine partly with alkalis, and become partly oxydized in the blood, especially when presented in the form of salts of the vegetable acids, so that Wöhler has observed that the free vegetable acids rob the system of alkaline matter, but that the salts of the same acids deprive the system of oxygen.

Mialhe says there is much greater danger in administering acids than there is in giving alkalis; for the natural secretions of the system being generally alkaline, it is not so easy to disturb their condition by the use of alkalis, as it is by that of acids. He states, moreover, that if natural alkaline fluids become neutralized, or, what is worse still, if they become acid, then functional disorders will result; for the vital fluids are no longer enabled to produce the necessary interstitial changes, and though the economy may struggle for some time against

this condition, yet it must ere long yield to it, and debility, wasting, together with such serious disturbances as pyrosis, gravel, gout, scurvy, or diabetes, may result. Besides these uses, acids are employed as Refrigerants, Astringents, and Tonics, and will therefore be mentioned again under these several heads. Dr. O. Rees recommends Lemon Juice in Rheumatic Fever.

Acidum Sulphuricum Dil.
Acidum Sulphuricum Aromaticum.
Potassæ Bisulphas.
Acidum Phosphoricum Dil.
Acidum Nitricum Dil.
Spiritus Ætheris Nitrici.
Acidum Hydrochloricum Dil.
Acidum Nitro-Hydrocloricum Dil.
Acidum Carbonicum.
in Carbonic acid water.
Acidum Oxalicum.
Binoxalate of Potash.
Oxalis Acetocella, and Rumex Acetosa.
Acidum Citricum.
Limonum Succus, Lemonade.
Acidum Tartaricum.
Potassæ Bitartras.
Acidum Aceticum.
Acidum Pyroligneum.
Acetum Pyroligneum.
Acetum Destillatum.
Syrupus Aceti.
Acid Fruits.
Vine Juice. Tamarinds.

ALKALINA. *Alkalis. Antacida.*

Alkalis, or Alkaline Earths and their Carbonates, introduced into the stomach, will there counteract the natural acidity of the gastric juice, or neutralize any acid that may be due to the nature of the food, or is the result of diseased secretions in the alimentary canal, in the same way that they would do out of the body. In diminishing acidity, they at the same time allay irritation; when a little in excess, they produce some stimulant effect on the stomach, but their continued use is necessarily injurious in neutralizing the healthy degree of acidity. In the intestinal canal they will be less so, because only adding to what is there the natural alkaline state of the secretions. Absorbed into the blood, they will increase the proportion of alkaline matter, and carried round by the circulation, they will diminish the acidity of secretions, as, for instance, that of perspiration as well as of the urine, and in the one case allay the irritation of and remove some cutaneous eruptions, as in the other they frequently control the deposition of lithic acid.

They are considered by some to increase the fluidity of the blood by diminishing its proportion of fibrine, and were hence included among his class of Liquefacients by Dr. Pereira. "It is on the account of the influence of liquefacients in checking phlegmonous inflammation, obviating its consequences, and promoting the removal of enlargements, indurations, &c., that they are frequently denominated resolvents." In poisoning by acids, they can be used successfully in counteracting their effects; but it must not be forgotten that some of them possess as corrosive powers as the poisons they are intended to counteract, though it is not usually necessary to present these in large quantities, for chalk, magnesia, and the milder bicarbonates and carbonates are fully efficacious. Applied to the surface

in a diluted state they diminish the irritation of some eruptions, while weak alkaline solutions, applied in soaked pledgets over the swelled joints in rheumatic fever, are found to relieve, probably by being absorbed, and diminishing the acid nature of the secretions.

Mialhe has observed that as the normal alkalinity of the fluids is necessary for the decomposition and assimilation of amylaceous substances, and probably for the absorption of fatty substances, so the employment of alkalis, generally useful, is injurious to those whose vital fluids are already supersaturated with them. Dr. Golding Bird has particularly called attention to the depurating effects of alkalis, their carbonates, and of such salts as the Acetates, Citrates, and Tartrates, which, in the system, are converted into carbonates. He believes that the action of potash in the system is similar to its effects out of the body in dissolving such protein compounds as albumen, fibrine, &c. He states that 3 drachms of acetate of potash, given in divided doses, within the 24 hours, caused an increase in the amount of solid matter from 416 grains, the normal quantity, to 782 grains, and that not only was the acetate converted into carbonate, and a large proportion of matter metamorphosed into uric acid and urea, but "the greatest increase was in that mixture of organic products set down as extractive, and consisting chiefly of creatine, creatinine, uroxanthine, and matter rich in sulphur." He also belives that the solvent power of the alkalis is exerted with the greatest energy on those tissues which are diseased, or are low in the scale of vitality. Dr. Bence Jones has further ascertained that tartrate of potash in large doses produces the most marked effect on the alkalescence of the urine; 120 grains of pure dry tartrate of potash, dissolved in 4 ounces of distilled water, making the urine alkaline in 35 minutes. Notwithstanding that practitioners have been in the habit of employing alkalis, and their carbonates, and that experimentalists have made the urine alkaline by giving them, Dr. Gardner, in his work on Gout, objects to their use as in most cases inefficacious. He states that ʒß doses of the alkaline phosphates, citrates or tartrates, frequently repeated, assuage the general irritation, and cause the disappearance of the uric acid from the urine, when this had resisted all change from the employment of carbonates. Alkalis, besides their caustic effects, are used, especially ammonia, as Rubefacients, and likewise as Alterative stimulants. Potash is preferred to soda as forming soluble salts, and Ammonia when a stimulant is required with an antacid. Magnesia is useful as a laxative antacid, and the calcined preferred to the carbonate, when we wish to avoid the extrication of gas. Chalk, sometimes called an absorbent, is useful in diarrhœa, from its apparently astringent effects, but which are no doubt due to its neutralizing acid, and thus diminishing irritation. Soap is selected as an ingredient with some resinous cathartics in some sluggish states of the intestinal canal.

Ammoniæ Liquor.
  Spir. Ammoniæ.
  Tinct. Opii Ammoniata.
Carbonate of Ammonia.
  Spir. Ammoniæ.
  Spir. Ammoniæ arom.
  Spir. Ammoniæ fœtidus.
Ammoniæ Sesquicarbonas.
  Liq. Ammoniæ Sesquicarb.
Ammoniæ Bicarbonas.
Potassæ Liquor.
Potassæ Carbonas.
Potassæ Bicarbonas.
  Liq. Potassæ Carbonatis.
  Liq. Potassæ effervescens.
Sodæ Carbonas.
Sodæ Liquor.
Sodæ Bicarbonas exsiccata.
Trochisci Sodæ Bicarb.
Liq. Sodæ effervescens.
  Sapo durus.
Calcis Liquor.
Carbonate of Lime.
Creta præparata.
  Testæ præparatæ.
  Mistura Cretæ.
  Trochisci Cretæ.
Pulv. Cretæ compositus ; with Tormentil and Saffron.
Pulv. Cretæ. comp. c. Opio.
  Confectio Aromatica.
  Hydrargyrum cum Creta.
Magnesia.
  Pulv. Rhei Comp.
Magnesiæ Carbonas.
  Mist. Camphoræ c. Magnesia.
Bicarbonate of Magnesia,
  or Soluble Magnesia.
  Hydrargyrum cum Magnesia.
Alkaline Mineral Waters, as of Malvern, Vichy, &c.
Some Oxides of Metals, as of Zinc.
Oils also act as Antacids.

The Acetates, Tartrates, and Citrates of potass and soda, being converted into carbonates, are extremely useful as antacids in the system.

Antilithics. *Lithontriptics.*

Antilithics (from ἀντὶ, against, and λίθος, a stone) is preferable as a name to Lithontriptics, and is applied as a general term to remedies which counteract the tendency to the deposition of urinary sediments or calculi. The urine, compound in nature, is very variable in the proportion of its constituents. In a state of health, it is acid from the presence, according to some chemists, of Super-lithate of Ammonia, while others think that the lithic or uric acid is combined with Soda, and a third set, that the acidity is due to an acid phosphate of Soda. Dr. Bence Jones has ascertained that the urine is more acid when the stomach is empty than when it is employed in the act of digestion. It then not only loses its acidity, but in some cases becomes alkaline. But there may be, and frequently is, an excess of acidity, not only in the urine, but in other secretions, owing to irregularities of diet or to disorders of the digestive functions; sometimes owing to a check to the functions of the skin. In such cases, called Lithic acid diathesis, a deposit takes place of a reddish powder, or rather of minute crystals of Lithic, that is, of Uric acid, or sometimes only of Urate of Ammonia, which may be dissolved by alkalis or dissipated by heat. In the last case, the deposit may not be due to any excess of acid, but rather to a deficiency of other ingredients which assist the solubility of the Urate of Ammonia, and therefore requiring diluents or soda water rather than powerful antacids. In other cases, white earthy deposits, which cannot be dissipated by heat, are observed. These are due to a portion of the

phosphatic salts contained in the urine, and which are deposited when the urine becomes alkaline in nature. They consist of the Ammonio-Magnesian Phosphate or the triple Phosphate of Ammonia and Magnesia, with some Phosphate of Lime, and constitute what is usually called the Phosphatic diathesis. At other times, called Oxaluria, there are deposits of octohedral crystals of oxalate of lime, and, under more varied circumstances than was formerly thought, that is both with lithic acid and the lithates as with the phosphates. So that it has been inferred that it does not always indicate structural disease, but often disorder of the digestive functions.

Attention to diet; vegetable food in some cases, meat in others. Exercise. Baths. Attention to the skin. Diluents, water distilled or mineral, but pure. Alteratives. Diaphoretics. Tonics.

In *Lithic* acid diathesis. Antacids (q. v.) are indicated.

Potassæ Liquor. Potassæ Carbonas et Bicarb. Liq. Potassæ Carb. and Liq. Potassæ effervescens.

Soda and its Carbonates. Soda exsiccata and Liq. Sodæ effervescens. Sapo durus. Waters of Vichy and other alkaline mineral waters.

Ammonia and its Carbonates; Stimulant and act as antacids in the stomach.

Effervescing saline draughts produce an alkaline reaction in the urine.

Potash and its Carbonates are more eligible than Soda, because the lithate of Potash is more soluble than that of Soda.

Calcis Aqua. Creta præparata. Testæ præparatæ.

The Tartrates, Citrates, and Acetates being converted into Carbonates, act readily in rendering the urine alkaline.

Magnesia and its Carb. Magnesia water. The Bicarb. with excess of Car′.

The Phosphate and Biborate of Soda also employed in similar cases.

Colchicum and Mercury both diminish acidity of the urine.

Tonics and vegetable bitters are required, with nourishing diet. Wine and opium. Avoid everything depressing.

In the *Oxalic* diathesis, the Nitric′, or better the Nitro-muriatic′, with Tonics, and Meat and nourishing farinaceous diet.

In the *Phosphatic* diathesis an acid is indicated.

Nitric′ and Muriatic′, also Phosphoric acid and Dil. Sul′. Mr. Ure has particularly recommended Benzoic acid and soluble Benzoates. Carbonic′.

Vegetable acids. Vinegar, and Tartaric acid render the urine acid more readily than the mineral acids.

Local Lithontriptics, as injecting very weak Nit′. into the bladder; or a weak alkaline solution, or simply pure water. Electro-chemical action. Lithotrity. Dr. E. Hoskins (*v.* Phil. Trans., 1843) recommends the introduction of weak solutions of chemical decomponents (as the Nitro-saccharate of lead) instead of solvents into the living bladder.

Refrigerants, *v.* p. 778.

Disinfectants. Antiseptics.

Disinfectants are substances suited to free the air of buildings and of rooms, as well as infected bodies in general, of the invisible, mostly imperceptible, others very odorous particles, whether arising from putrescent matter or from miasmata, and which are the source of infection and propagate disease. Some of the means employed for this purpose are purely mechanical, but are not less effectual as insuring ventilation and a free supply of pure air. Great heat destroys the

infectious matter of some diseases, while some chemical agents destroy the offensive odour of many effluvia, and have hence been inferred to have the power of rendering miasmata inert. Fumigations and Pastils, Balsamic Resins, Aromatic Vinegar, though diffusing agreeable odours, are often worse than useless, from concealing, and thus diverting attention from the sources of effluvia. Antiseptics are chemical agents which prevent the decomposition of organic structures, whether vegetable or animal, usually by forming a chemical combination with one or more of their constituents. At other times great cold, great dryness, or the exclusion of air, will enable such substances to be preserved. Charcoal is occasionally applied to foul ulcers, or given in a fœtid state of the breath or of the excretions.

Ventilation.
- Great heat.
- Diffusive Gases which act chemically, especially Chlorine.
- Liq. Chlorinei.
- Liq. Sodæ Chlorinatæ.
- Calx Chlorinata.

Acid fumes, as of Sulphurous and Hydrochloric acid gases.
Nitrous acid fumes; Acetic and Pyroligneous acids are less effective.
Destruction of infected matter and odours by great heat, by application of Quicklime, and of Charcoal.
Zinci Chloridum (Burnett's).
Pyrolignite and Perchloride of Iron (Ellerman's).
Plumbi Nitras (Le Doyen's).
Plumbi Acetas.

Antiseptics.
- Chlorine.
- Mineral acids.
- Arsenious acid.
- Bichloride of Mercury.
- Salt.
- Nitre.
- Alum.
- Chloride of Lime.
- Sulphate of Iron.
- Alcohol.
- Creasote.
- Tannin.
- Sugar.
- Empyreumatic Oils.

Astringentia. Astringents.

Astringents are remedies which have the power of corrugating or of producing a contraction of the muscular fibres of the part to which they are applied, as well as of coagulating or precipitating albuminous fluids. The possession of astringency in any substance is easily recognized by its having the property of corrugating the papillæ of the tongue when tasted, but otherwise there is no principle common to the whole, some being mineral acids, others metallic salts, with the earthy salt alum, while many are obtained from the vegetable kingdom; but all have the power of coagulating albumen. The first effect of an astringent is visible when brought into contact with a bleeding wound (then called a Styptic), in the contraction which stops the bleeding from small vessels, by contracting the muscular fibre of their coats. In this way, when applied to mucous surfaces, they diminish secretion. That their effects are due to chemical action is evident from similar effects being produced on dead animal matter, as is seen with many of the astringents in the act of tanning. But, like other chemically acting remedies, they have a further action,

by diminishing relaxation and thus giving a tone to the stomach, and thence, acting dynamically, they produce a powerful effect on the system. They thus obviate general debility, act as permanent stimulants, and assist in curing intermittents, though their first effects appear of so local a nature. Some are, no doubt, absorbed into the blood, and making the circuit of the circulation, produce their constringing effect on the capillaries, and passing through glands with the secretions, they may there also produce some of their effects. Of the Mineral Astringents, Sulphuric acid and alum are the most powerful: the Acetate of Lead is very useful in the same class of cases, but these cannot be prescribed together, as Sulphate of Lead would be produced. The system is apt to suffer from the poisonous effects of Lead, if long continued, but the blue line, as observed by Dr. Burton, at the edge of the gums, is an indication of the necessity for intermitting the drug.

Of the Vegetable Astringents, the Tannic and Gallic acids are the most powerful, the former for external, and the latter for internal exhibition. The different vegetables owe their efficacy to the presence chiefly of the first of these acids, which coagulates albumen, though Gallic acid does not do so. But M. Pelletier having found that a mixture of a solution of Gallic acid with one of Gum will precipitate albumen, Mr. Headland has ingeniously inferred, that Gallic acid may unite in the blood with a saccharine matter which is similar in composition with gum, and "by this acquire chemically an astringent power, which it is not able to exert on external parts, because then isolated. But the saccharine matter is required in the system for special purposes, and thus Gallic acid passes out with the secretions alone."

Astringents are thus employed externally to obviate relaxation, and to stop hæmorrhage from small vessels. Internally, to give a tone to the stomach in cases of Dyspepsia and of Debility, to control inordinate discharges or hæmorrhages from the different viscera, and sometimes to cure intermittents in conjunction with some aromatic.

Cold. Cold Water. Freezing Mixtures. Quietude.
Acids, mineral as medicines; vegetable, diluted as drinks.
Acid. Sulph. dil. Acetum. Refrigerants.
Alumen. Pulv. comp. with Kino.
Liq. Aluminis comp. with Sulph. Zinc.
Cataplasma Aluminis. Borax.
Plumbi Acetas. Ung.
Pil. Plumbi Opiatæ.
Plumbi Diacet. Liq. et dilutus, et Ceratum.
Zinci Sulphas (*v.* Liq. Aluminis comp.) Zinci Acetat. Tinct.
Ferri Sulphas. Tinct. Ferri Sesquichloridi.
Cupri Sulphas. C. Ammonio-Sulphas. et Diacetas.
Calcis Aqua. Creta præparata.
Zinci Carbonas et Hydrargyri Ammonio-Chloridum externally.
Tannic and Gallic acids.
Hæmatoxylon, Dec. et Extr.
Krameria, Inf. et Extr.
Catechu. Inf. Tinct. et Elect. with Opium.
Kino. Tinct. et Pulv. comp. with Aromatics and Opium.
Granatum Fructus Cortex.
Prunus spinosa.
Tormentilla et Dec. Bistorta.
Quercus Cortex, Dec. et Extr.

Gallæ: Tinct. Ung. et Ung. comp. with Opium.
Rumex aquaticus. Geum. Lythrum.
Rosa gallica, Conf. Syr. Mel. and Inf. comp. with Dil. Sulphuric acid.

In Hæmorrhages: Styptics, Compresses, Plugs.
Matico. Agaric. Creasote. Opium. c. Plumbi Acet. Ergot in Uterine Hæmorrhage.

ANTIDOTES, *v.* Table, p. 782.

C. VITAL AGENTS.

This division, introduced by Dr. Young, has been adopted by Dr. A. T. Thomson, and includes the remainder of the groups of medicinal agents, which are considered to act more especially upon the living structures; that is the muscular, sanguineous, and secerning systems, and all as dependent upon the nervous system. But, as we have seen, with the mechanical and chemical—though a portion of the effects of the medicinal agents may be considered strictly to be of the nature of the divisions under which they are placed, yet other effects are as properly dynamical. So with this division of vital agents, some of their effects are undoubtedly due to the chemical agencies of the respective remedies. They however differ very much from each other in their several modes of action. The subdivision of Evacuants for instance acts chiefly upon glands and the secerning system. Among these we have placed the class of Alteratives. Others act directly upon the nervous system, either increasing or diminishing nervous force, though the class of Tonics are considered to act chiefly on the muscular and sanguiferous systems.

1. EVACUANTIA. *Evacuants.*

The groups of remedies placed under this subdivision, cause increased secretion or evacuation from different organs. They were separated by Dr. Murray from General Stimulants under the title of *Local Stimulants*, for which Dr. Paris suggested the name of Special Stimulants. Dr. Pereira includes them under the head of *Eccritica*, and Mr. Headland most of them under that of *Eliminantia*. The majority increase secretion, and are themselves excreted, but this they cannot do without producing alterations in the fluids and solids of the body, and therefore the class of remedies usually called Alteratives may most fitly be united with them. As increased secretion is usually followed by more or less of exhaustion, some of them are frequently employed to lessen the mass of circulating fluid, or to relieve one organ by causing a determination to another. Hence some of them always form a part of antiphlogistic treatment. The Rubefacients, however, except when used as vesicants, do not produce an increased secretion, but they relieve internal affections by causing a determination to the surface, and thus act on the same general principle.

ALTERANTIA. *Alteratives.*

The term *alterative*, so commonly employed, is differently interpreted by different authors. Müller includes under it all such remedies as are neither stimulant nor sedative, and have the power of effecting changes in the state of the living solids, and consequently in the functions which they perform. The term is, however, usually applied to such as, taken in comparatively small doses, and continued for some time, by degrees and almost without any perceptible effect, produce changes in the secretions and in disordered actions. Others consider them as stimulants which act specially upon particular glands and upon absorption in general. Bouchardat defines alteratives as medicines which are absorbed, and which act by modifying in a permanent manner the motions of the blood and of the different secretions. This makes them nearly to coincide with Mr. Headland's subdivision, Catalytica, of Hæmatica, or blood-medicines, all of which act while in the blood, which they influence; but the Catalytics "act so as to counteract a morbid material or process, and must pass out of the body."

Under the head of Alteratives are included Iodine, Mercury, Gold, occasionally some other metals. The Chlorides of Barium and of Calcium were formerly much used, as the Alkalis still are. In alterative treatment is usually included the taking of various decoctions, as of the *woods*, or of substitutes for them in the form of the Decoctions of Sarsaparilla and of Guaiacum, which, taken with large quantities of water, must operate chiefly by its diluting and solvent properties, and partly by the stimulant, perhaps alterative effect, of the active principles of the several ingredients in these diet drinks, which, though small in quantity, must be absorbed and conveyed into the capillaries.

As Iodine and the metals are insoluble, Mialhe has inferred that they become oxydized by the fluids of the stomach, and are then converted into chlorides, or double chlorides, and becoming soluble are absorbed into the circulation; that Iodine and Bromine seize on the alkalis contained in the fluids, and are changed into Iodides and Bromides, and are afterwards excreted. The mercurial preparations, he conceives, are reacted on by the solutions of the alkaline chlorides, either with or without the access of atmospheric air, and that they thus give rise to the production of some corrosive sublimate, and that corrosive sublimate and albumen form a compound which is insoluble in water, but which in its hydrated state is soluble in the alkaline chlorides, and that it is in this form that mercury gains access to the circulation. He recommends that the Bichloride be administered in small doses, as from $\frac{1}{10}$ to $\frac{1}{2}$ of a grain daily, and that it should be given in solution with a little common salt and Sal Ammoniac, as these keep the Bichloride soluble, and prevent it from acting on the

tissues of the alimentary canal. Bouchardat, however, conceives that this is attributing an exaggerated importance to the Chloride of Sodium, and that the principal solvent of metallic preparations is the Chloride of Ammonium (p. 73), or Sal Ammoniac, and which he says, he has frequently found in the digestive apparatus of animals.

Mercury, in some of its preparations, acts as an irritant. (*v.* Local and Special Stimulants, Escharotics, Errhines, Cathartics.) But when some of its suitable preparations, as Blue or Plummer's Pill, or Corrosive sublimate, are prescribed in small doses, with considerable intervals, or every night or so, there is by degrees perceived an improvement in the function of digestion, as well as in the evacuations, with a softer state of the skin. If larger doses are given, or more frequently, some excitement in the circulation may be observed, as well as in the absorbent system, and in the several secretions, as is instanced in the stimulation of the liver, the kidney, and in the healthful perspirable state of the skin. The less observable effects dependent on smaller doses, spread also over a greater space of time, will produce that alteration in disordered actions, so as to cause an improvement in the digestive and nutrient functions, the disappearance of eruptions, and the removal of thickening of the skin or of other tissues. A greater degree of the same action will diminish the plasticity of the fibrine of the blood, promote the absorption of glandular enlargements, or of indurated structures; and thus the deobstruent effects of Mercury will be obtained. All this may be short of the constitutional effects, indicated by fœtor of the breath, redness of the gums, followed by salivation, often very profuse, and even by ulceration; but often the beneficial effects are only observed when some of these phenomena display themselves, though in a very slight degree. These effects, or Mercurialism, as the state is called, may be produced either by repeated small doses, by one or two larger ones, or by rubbing Blue Ointment into the skin, or using the Mercury in the form of fumigation. But many deleterious consequences follow from the unadvised use of Mercury and its preparations.

Iodine, like Mercury, will, in concentrated doses, act as an irritant on the surface to which it is applied. Hence some of its preparations are poisonous. But if it be taken for some time in small doses, the stimulant effects are observed in the increased perspiration, often in the improved secretion of bile, as well as of urine; while the mucous membrane of the nostrils becomes inflamed, as in catarrh. But the characteristic phenomenon in the action of Iodine is the promotion of absorption, hence the disappearance of syphilitic nodes, of glandular enlargements, as in the case of Goître, or even of healthy glands, as of the mammæ and testicles under its long-continued use. Other symptoms observed are included under the term Iodism, which, in addition to some of the foregoing, is especially characterized by giddiness and headache, nausea, restlessness, weakness, and emaciation, with a weak but frequent pulse. It ought to be intermitted

for a time on the first appearance of any of these symptoms. In the Iodide of Iron the alterative effects of the Iodine are combined with the tonic effects of the Iron.

Bromine and the Bromide of Potassium, perhaps also Chlorine, may be used for many of the same purposes as Iodine. The preparations of Gold as the powder, and the Chloride of Gold and Iodine, or the Terchloride, are likewise stimulants of the absorbents, and may, with great benefit, be used in Scrofula and Secondary Syphilis.

Arsenious acid, mentioned also as an antiperiodic, under the head of Tonics, is usually prescribed in the form of Liq. Potassæ Arsenitis, sometimes in that of Liq. Ammoniæ Arsenitis. De Valangin's mineral solution, a preparation esteemed by some, is composed of a Terchloride of Arsenic. Arsenic is a powerful alterative in many skin diseases, especially Lepra and Psoriasis, but also in others, as Eczema and Lupus. Mr. Hunt, who has employed it much in such affections of late years, recommends commencing it in full doses of from three to five minims of Fowler's solution. It is generally discontinued when the symptoms of accelerated pulse, weakness and itching of the eyes, griping, restlessness at night, or a great feeling of weakness and lowness of spirits are experienced. Mr. H. recommends diminishing the dose, and continuing the medicine, so as not to lose its effect in some of these obstinate diseases. Sulphur, Pitch, and Tar are other alteratives in similar affections. Antimonial preparations, and especially its combinations with Sulphur, are also frequently used as alteratives in skin diseases.

Before the discovery of Iodine, the Chlorides of Calcium and of Barium were most frequently employed as stimulants of the glandular and lymphatic symptoms, and were formerly much employed in scrofulous diseases, in Bronchocele and other glandular complaints, as well as in chronic skin diseases. The Alkalis also, as Liq. Potassæ and the Carbonates, when taken for some time, besides the effects described under the head of antacids, as dissolving the fibrine of the blood, produce many of the same effects as Iodine, &c., in removing glandular swellings. They are supposed to diminish the consistence of the blood, rendering it more watery, and reducing the habit to a state resembling scurvy. Dr. Pereira proposes the term of Liquefacients, as synonymous with the *verflüssigende mittel* of Sundelin, for medicinal agents which augment the secretions, check the solidifying, but promote the liquifying, processes of the animal economy, and which, by continued use, create great disorder in the functions of assimilation.

Cod-liver oil has of late years been one of the most extensively employed of alteratives, and is no doubt very beneficial in cachectic habits, improving the secretions and fattening, at the same time that the condition of the system is improved.

Mercurials. Hydrargyri Pil. Hyd. c. Creta. Hyd. c. Magnesia. Ung. fort. et mitius.

Hydrargyri Cerat. comp. with Soap and Camphor. Lin. comp. with Camphor and Liq. Ammoniæ. Emp. et Emp. Ammoniaci c. Hydr. Hydrarg. Oxydum.
Hyd. Iodidum Pil. et Ung. Hyd. Biniodid. et Ung.
Hydrarg. Chloridum (Calomelanos). Pil. comp. with Oxysulph. of Antimony and Guaiacum. Ung.
Hydrarg. Bichloridum et Liq. with Sal Ammoniac.
Hydrarg. Bisulphuretum and Sulphuretum c. Sulphure, for fumigations.
Hydrarg. Nitratis Ung. et Lin. Ung. Hyd. Ammonio-Chloridi.
Iodineum. Iodide of Starch. Tinct. Tinct. et Ung. comp. with Iodide of Potassium.
Potassii Iodidum. Ung. Ung. et Tinct. comp. with Iodine. Liq. comp. with Iodine.
Ferri Iodidum et Syr. Hydrargyri Iodid. et Biniodidum. Plumbi Iodidum et Ung.
Burnt Fuci, or Sea-weeds. Burnt Sponge. Cod-Liver Oil.
Bromineum. Potassii Bromidum. Bromide of Iron.
Acidum Arseniosum. Liq. Potassæ Arsenitis. Iodide of Arsenic, and Mercury.
Alkalis, &c. Liq. Potassæ. Potassæ Carb. Potassæ Bicarbonas.
Calcis Aqua. Calcis Chloridi Liquor.
Barii Chloridi Liquor.
Auri Pulvis. Chloride of Gold and Sodium.
Acid. Nitro-Muriaticum. Antimonii Oxysulph. Tartar Emetic.
Mild Vegetable Alteratives. Sarza. Dulcamara, et Dec.
Taraxacom. Dec. et Extr. Rumex aquaticus et Hydrolapathum. Ulmus.

Errhina. *Errhines. Sternutatories.*

Errhines (from ἐν and ῥίν, the nose) include all medicines which are applied to the mucous membrane of the nostrils. The term of Sternutatories is restricted to those which cause sneezing. Errhines may be applied in a dry, soft, liquid or gaseous state. They may be Emollient, Astringent, or Stimulant. The first sheathing irritated surfaces, the second restraining inordinate secretion the consequence of relaxation, and the third favouring the natural mucous discharge on the return of the secreting surface to a healthy state. Though generally local in their effects, they often afford aid by revulsion in chronic affections of neighbouring parts. Sternutatories are obtained both from the mineral and from the vegetable kingdom.

Aromatic Errhines. Powdered leaves of Labiatæ, as of Melissa, Lavandula, Rosmarinus, Origanum. Tencrium Marum is often called Headache plant. Powdered Iris-root. Asarum. Pulv. Asari comp. with Lavender flowers.
Ammonia and its Carbonates. Acetic acid, &c. Tabacum as Snuff.
Acrid Substances, as Veratrum album. Veratria. Euphorbium. Hydrargyri Subsulphas flavus. All act as Sternutatories, but must be mixed with some mild powder. The fumes of Biniodide of Mercury.

Sialogoga. *Sialogogues.*

Sialogogues (from σίαλον, and ἄγω, to drive) are medicines which increase the secretion of saliva. This may frequently be effected by chewing a nearly inert substance, such as mastic, or an astringent and stimulant, like the Catechu and Areca nut, wrapped up in a leaf

of Piper Betel of the East, or the Tobacco of America and Europe, or by the use of acrid or of spicy, or of warm stimulant substances. Salivation may also be induced by the secondary effects of Nauseants, or produced by the action of Mercurials; when not only is the secretion increased, but the medicine itself is excreted. They may be useful from their local or from their derivative effects in affections of the head and face.

Acrids. Sinapis. Armoracia. Pyrethrum. Mezereon. Iris-root, Angelica.
Spices. Zingiber. Piper nigrum et album. Capsicum.—Mastiche.
Astringent. Catechu. *Astringent and Purgative.* Rheum.
Stimulants. Applications of Oil of Cloves and of Creasote, &c.
Mercurial Preparations, see Alterative Stimulants.

EMETICA. *Emetics.*

Medicines which evacuate the stomach by vomiting: an act caused partly by irritation induced on the stomach, and partly by influence produced on the brain and nervous system. The latter form we see in the reflex action produced by tickling the fauces with a feather. The influence of the brain we see in sea-sickness, and, also, in the difficulty with which Emetics act in narcotic poisoning or drunkenness. Emetics differ much among themselves, some acting only when introduced into the stomach; others, as Tartar Emetic, if applied to any other part of the body, so as to be absorbed into the system. The effect is not altogether dependent upon the nature of the substance, for Ammonia and Mustard, which in small doses act as Stimulants, and Sulphates of Zinc and Copper as Tonics, in large doses evert the action of the stomach, and produce an emetic effect, generally quickly, and without debilitating the system. Others act more slowly, and produce long-continued nausea, and the depressing symptoms which accompany such a state, and which favour absorption. These therefore, as well as from their slow action, are not suited to cases of poisoning. With both, the act is accompanied by a series of concussions which favour the excretion and secretion of the biliary, pancreatic, and intestinal fluids, with a determination to the skin. But this very concussion makes them dangerous when there is a determination to the head, or in advanced stages of pregnancy, in Hernia, &c. But they are useful before the accession of an intermittent, also in bilious Fever, in Asthma, Hooping-cough, or merely for the purpose of evacuating the stomach.

Direct Emetics, and acting quickly. Ammoniæ Liq. Ammoniæ Sesquicarb. Liq. (f℥ß.—f℥j. of either taken in a glass of cold, followed immediately by some warm, water). Sodii Chloridum.
Zinci Sulph. Cupri Sulph. Cupri Ammonio-Sulph. Ærugo.
Sinapis nigra. Sinapis alba. Pure Flour of Mustard.
Indirect Emetics. Antimonii et Potassæ Tart. (Tartarum Emeticum, D.) Vinum or Antimonial Wine.
Antimonii Oxidum, E. Sesquisulphuret. et Oxysulphuretum.

Ipecacuanha. Pulv. Vin. et Syr. Emetine. Viola odorata.
Scilla, Pulv. Tinct. et Syr. Asarum and Euphorbium, but both too acrid.
Anthemis, Inf. et Dec. comp.; assists vomiting.
Tabacum. Lobelia inflata; but both are unsafe as Emetics.
Ipecacuanha and Tartar Emetic are often combined together, or the latter may be prescribed with a Cathartic, forming an Emeto-Cathartic.

Expectorantia. *Expectorants.*

Expectorants are medicines which are supposed to have the power of favouring the expulsion or the secretion of mucus (*ex pectore*) from the organs within the chest; that is, from the secreting surface of the trachea, and from cells and passages of the respiratory organs. These, like some other groups of medicines, are *relative* agents; that is, their action bears a relation to, or depends upon the nature of the case, the state of the patient, the period of the disease, &c. Thus, in a state of excitement, with dryness of the skin, &c., Venesection, Warm-bath, Nauseants, and Demulcents, may be useful, and also some narcotics for allaying irritation and diminishing spasm. In other cases, where there is a deficiency of action, or, with sufficient secretion, a deficiency of power to expel the mucus or other matters which may have been secreted, stimulants are found to be necessary. We may employ some in the form of lozenges, which coming in contact with the upper part of the trachea, may have their effects propagated by sympathy; or we may make use of others in the gaseous form. Some, taken internally, are absorbed into the blood, and carried round to the mucous surface of the lungs, where they produce their stimulant effects, and are excreted, and may be smelt in the breath. Tonics may be useful in many cases by improving the state of the constitution, and restoring the secretions in general to a healthy condition; and, among others, that of the bronchial passages with the healthful power of expectoration.

Emetics acting mechanically favour expectoration. Sulph. of Zinc, or of Copper, or Carb. of Ammonia.

Demulcents and *Refrigerants*, by allaying irritation, and by obviating a dry state of the skin, favour expectoration.

Inhalations of warm Water, and of Demulcent Decoctions. Warm Baths. Pediluvia, by relaxing the skin.

Gummy Substances internally. Isinglass. Jujubes. Pâte de Guimauve. Liquorice. Quince and Linseed, &c.; see Demulcents.

Nauseating Expectorants. Antimonials. Vinum Antim. Tartar Emetic. Antimonii Oxydum, E. Pulv. Antim. or James's Powder.

Ipecacuanha. Pulv. Syr. et Vinum, with *Narcotics, &c.* Pulv. comp. with Opium, and Pil. comp. with Opium, Squill, and Ammoniacum.

Pil. Conii. comp. with Ipecac. Anod. Expect. so Ipecac. and Henbane.

Tinct. Camphoræ comp., with Opium and Benzoin. Smoking of Stramonium and Belladonna leaves. Tobacco.

Stimulant Expectorants. Sulphur and Alkaline Sulphurets. Senega, Dec. et Inf.

Balsams. B. Peruvianum, Syr. et Tinct. Styrax. Benzoin. Tinct. comp.

with Myrrha in Pil. Galbani comp. Balsam of Tolu. Benzoic Acid in Paregoric.

Fœtid Gum-Resins. Assafœtida. Mist. et in Pil. Scillæ comp. Ammoniacum. Galbanum.

Copaiba in Emulsion or in pills with Magnesia. Scilla, Pulv. Acetum, Tinct. et Oxymel. Pil. comp. with Ammoniacum and Ginger. Mist. Cascarillæ comp. with Acetum Scillæ et Inf. Cascarillæ. Allium sativum, &c.

Succinic acid and Oil. Petroleum. Naphtha.

Stimulant Lozenges, as of Capsicum, or of Astringents, as Catechu, in cases of relaxation.

Inhaling Stimulant vapours, as of Benzoin and Benzoic′, of Acetic acid, of much diluted Chlorine, Ammonia, &c.

Demulcent Tonics. Cetraria. Tussilago Farfara. Inula Helenium. Marrubium vulgare. Archangelica, and other Tonics.

Diaphoretica. *Diaphoretics.*

Diaphoretics are medicines which increase exhalation from the surface and the natural function of perspiration. To these, when acting so as to produce sweating, the term of *Sudorifics* is applied. The function of perspiration is useful in keeping down temperature, and in carrying off much Carbon, Hydrogen, and even Oxygen from the blood. Like that of the secretion of urine, it varies in the same individual at different times, because under the influence of different circumstances, as the state of the constitution, the nature of the food, the temperature, dryness, or rarefaction, moisture, or coldness of the atmosphere. The action of a Diaphoretic is influenced by many of the same circumstances. Hence it frequently depends entirely upon our keeping the patient in bed that it promotes Diaphoresis; while if the patient is up, and has the skin exposed to the cool air, it will act as a Diuretic. These two functions are very often antagonistic to each other: therefore when Diaphoretics act freely, much aqueous matter will be carried off by the skin, and the quantity of urine diminished, as well as the secretions of the intestinal canal, by thus causing a determination to the surface. Some act by at once relaxing the surface, others act at first as stimulants, and then produce sweating, when some are probably themselves excreted. The patient requires to be kept *in bed*, and warm diluents should be prescribed; the *skin* should be *clean* and *warm*, hence the double utility of warm *water* and *vapour* baths, and whatever determines to the surface, as *friction* with brushes, application of *heated bodies*, of *Rubefacients*, of *dry air*, of some *gases*, as *Carbonic′ gas*, and *Chlorine*. In other cases *exercise*, or the sympathetic influence of a glass of *cold water* will produce diaphoresis. From their mode of action and effects, it is evident that they are of extensive application, as those which are relaxing in febrile and inflammatory affections, others in rheumatic and some chronic diseases. According to the nature of the case or the period of the disease, either the relaxing or stimulant Diaphoretics will be eligible in pulmonary affections, in bowel complaints, in cutaneous diseases, or in Dropsy.

Diluent Diaphoretics. Warm water. Tea. Gruel, &c.

Antimonials. Antimonii Oxydum, E. Pulv. Antim. comp. Pulv. Jacobi verus. Antimonii Sesquisulphuretum præp. Ant. Oxysulphuretum. Antimonii et Potassæ Tartras (Tartar Emetic). Vinum.

Ipecacuanha. Emetine. Pulv. Syr. et Vinum. Pulv. Ipecac. comp. with Opium. Pil. Ipecac. comp. with Opium.

Stimulant Diaphoretics. Sulphur. S. lotum, et S. præcipitatum. Potassii Sulphuretum et Aqua.

Mercurials. Pil. Hydrarg., &c. Pil. Hyd. Chloridi comp. Pil. Calomelanos et Opii. Hydrarg. Sulphuret. c. Sulph.

Ammoniæ Liq. Sp. Ammon. arom. Liq. Ammoniæ Acetatis et Citrates. Effervescing and Saline Draughts.

Alcoholic and Ethereal Draughts. Sp. Ætheris Nitrici. Petroleum. Naphtha.

Opium (*v.* Narcotics). Pil. Ipecac. c. Opio. Pil. Calomel, et Opii. Morphiæ Hydrochloras et Sol. Morphiæ Sulphas. Morphiæ Acetas.

Senega, Inf. et Dec. Guaiacum, Mist. Dec. Tinct. et Tinct. Ammon.

Serpentaria, Inf. et Tinct. Contrajerva. Mezereon. Inula. Sassafras.

Infusions of Vegetable Excitants, as of Sage, Rosemary, &c.

The milder Diaphoretics and Alteratives are Sarza, Hemidesmus indicus, Calotropis, Dulcamara.

Diuretica. *Diuretics.*

Diuretics are medicines which are considered to have the power of augmenting the secretion of urine; and as the purpose of this function is to eliminate from the blood, not only water, but various salts and nitrogenous substances, whether arising from excess of food or from effete tissues; there is no doubt of the importance of any measures which may tend to restore it when suppressed, or augment it when diminished, or requiring for any reason to be increased. As in the case of the function of perspiration, so in that of the secretion of urine, many external circumstances influence its due performance. It has also been stated that these two great functions on many occasions mutually supply the place of, and alternate, with each other, and that frequently the causes which favour the one secretion will interfere with the due performance of the other. It follows, therefore, that an opposite course requires to be followed with regard to the treatment of a patient. Hence the skin must be kept cool, and the patient kept out of bed. Therefore the day time is frequently the best time for the exhibition of Diuretics. Their action is assisted by coldness and dampness of the atmosphere, and also by the moderate, not excessive, use of diluents; and is impeded as the secretion of urine itself is by too free an action of the intestines or of the function of perspiration, as well as by whatever increases plethora and pressure on the circulation, or promotes congestion in the liver or in the kidney itself. As the action of some Diuretics is incompatible with that of others, it is absolutely necessary to pay attention to the peculiar mode of action of each. This has been well done by Dr. Paris, whose arrangement we have adopted, but have reversed its order, for the purpose of better comparing the list with that of Diaphoretics, as well as of other Therapeutic agents.

The action of Diuretics is greatly assisted by the aid of Diluents, so under the heads of Acids, Alkalis, and Antilithics it has been stated how much they change the state of and are themselves excreted with the urine; but for this very reason they may be unsuitable when the object is merely to increase the quantity of, without altering the chemical nature of, the urine. But for many cases, the saline diuretics are very eligible; it is necessary to remember that not only the alkalis, but the salts of the vegetable acids, will render the urine alkaline, and assist in the elimination and removal from the body of effete animal structure. The Nitrate of Potash is not only one of our most certain saline diuretics, but Dr. G. Bird has called attention to its depuratory effects, and he recommends it in doses of ℥ß or ℥j. dissolved in two or three pints of any diluent in the twenty-four hours. An enormous quantity of urine replaces the scanty excretion generally noticed in rheumatism, and the cure of the patient is considerably expedited. In other cases, whatever acts upon the system so as to promote absorption, will seem to have a diuretic action, as, for instance, Tonic and Stimulant medicines in cases of debility. So again, when diminution of the urine is owing to general pressure on the circulation in inflammatory, and to a stoppage of secretions in febrile, states of the system, then venesection, warm baths, and antimonials by producing relaxation and a more natural state of other organs, will at the same time restore the secretion of urine to a healthy state. In like manner, Digitalis, Lobelia, Lactucarium, by diminishing arterial action, may favour absorption. While Mercurials, by improving biliary secretion and relieving the portal circulation, will thus facilitate the secretion of urine. Of the Stimulant Diuretics, some owe their properties to the presence of volatile oil ; that of Juniper was found by Dr. Alexander to act powerfully when a few drops were added to Tea. Others secrete particular principles, while some even of the diffusible stimulants are found useful in other cases. Hence Diuretics may be beneficially employed in very different states of the system, and be useful in freeing it at one time of any excess of fluid, and at another serve to carry off some of the solid constituents of the body, and some may be useful even by their contra-stimulant effects.

1. *Medicines which act primarily on the Stomach or System and secondarily on the Urinary Organs.*

a. By diminishing arterial action, and increasing that of absorption.
Venæsection and some parts of the Antiphlogistic treatment may be considered to act in this way, as well as Digitalis, Pulv. Inf. Tinct. et Extr. Pil. Dig. et Scillæ. Linim. with Ammonia, and the Inf. or the Tinct. with Soap Liniment. Colchicum. Tabacum, Vinum. Lactucarium and other Narcotics.

b. By increasing the tone of the Body in general, and that of the Absorbent System in particular.
Bitter Tonics, q. v., the effects of some others, as of Chimaphila, may be ascribed partly to their Tonic effect.

c. By producing Catharsis, and thereby increasing the action of the Exhalants directly, and that of the Absorbents indirectly.
Elaterium. Gambogia. Jalap. Pulv. Jalapæ comp. See Cathartics.

2. *Medicines which act primarily on the Absorbents, and secondarily on the Kidneys.*
Mercurials. Hydrarg. Chloridum et Bichlorid. Iodine. Potassii Iodid. Liq. et Tinct. comp. Mercurials with Squill, &c.

3. *Medicines which act primarily on the Urinary Organs.*
Potassæ Liquor. Potassæ Carb. et Liq. Bicarb. Potassæ Aqua efferves. Potassæ Nitras et Potassæ Chloras.

Potassæ Acetas. et Citras. Potassæ Bitartras, also Potassæ Sulphas in Pulv. Jalapæ comp.

Sodæ Acetas and Citras. Sodæ Potassio-Tartras.

Nitre in gr. x. doses sometimes prevents Incontinence of Urine, as does Tinct. Ferri Sesquichloridi.

Sodæ Carb. et Bicarb. Sodæ Biboras. Sodæ Phosphas. Sapo durus.

Magnesiæ Sulphas. Diluted Mineral acids, and some Mineral waters.

Stimulant Diuretics. Ammoniæ Liq. et Sesquicarb. Spiritus Ætheris Nitrici. Rhine Wines, especially with Squill and Bitter Tonics.

Armoracia. Inf. comp. with Mustard Seed and the Comp. Spirit, which contains Orange-peel and Nutmegs. Cochlearia.

Scoparium, Inf. et Dec. comp. with Juniper-berries and Bitartrate of Potash. Carotæ Fructus. Parsley and other Umbelifers. Asparagus.

Juniperi Baccæ et Cacumina. Ol. et Spir. comp. with Caraway and Fennel Fruits. Terebinthina et Oleum.

Squilla. Pulv. Acetum, Tinct. Allii species. Colchicum. Veratrum.

Senaga, Inf. et Dec. Diosma (Buchu), Inf. and Tinct. Chimaphila (Pyrola). Uva Ursi, Dec.

Aretium minus (Lappa). Pareira brava, Inf. et Extr. Sarza. Dulcamara, Dec. Ulmi Cortex.

Cantharides, Tinctura.

Copaiba et Oleum, E. Cubebæ. Ol. Cubebæ, stimulants of the Urethra.

CATHARTICA. *Cathartics. Purgatives.*

Cathartics (from καθαίρω, I purge) are medicines which increase the peristaltic movements of the intestinal canal, evacuate its contents, usually augment its mucous secretions, and often promote the separation of the excreted products, which Liebig has inferred to be one province of the bowels to separate from the blood. They were formerly distinguished into *Hydragogues*, when causing watery evacuations, *Cholagogues*, as favouring the secretion of bile, &c. Many other terms have ceased to be employed; but these continue to be still used. Cathartics are also often distinguished according to their energy of action, as Laxatives, which merely evacuate the intestinal contents, and Purgatives, which stimulate secretion and accelerate evacuation. But among the latter the more violent are distinguished by the name of Drastics and of Hydragogue Cathartics, while others may be ranged under the head of CHOLAGOGUES, with a few other medicinal agents, which are not however cathartic.

Cathartics differ also according to their mode of action, and also with reference to the part of the intestinal canal to which their action is more particularly directed. Thus some things probably act only as mechanical irritants on the intestinal surface, and a subsequent

effect is produced by nervous reflex action; for instance, brown bread, which, though called digestive, acts as an aperient from the bran of the wheat not being digested, as is the case also with the elephant-bread of India, some small seeds, &c. Most of the true cathartics are, however, first absorbed into the system: many produce their effects when introduced by some other medium than the intestinal canal; some have been proved to be excreted with the excrementitious matter, and all, therefore, are supposed thus to cause purging. Saline purgatives, often called cooling medicines, act mildly on the whole intestinal canal, producing copious watery evacuations. Castor Oil stimulates superficially but gently, the mucous surface of the small intestines in moderate doses, but may be made to act violently when these are increased. Senna also acts on the small intestines, but with more activity, often causing nausea and griping. Jalap, Scammony, and Colocynth are more or less acrid, and act with energy upon the whole extent of the intestinal canal. Rhubarb evacuates, but exerts a subsequent tonic effect. Aloes, slow in its effects, stimulates the colon and rectum.

Hellebore, Croton oil and Elaterium, act with great violence, as well as rapidity, and causing copious watery motions, are specially called Hydragogue Cathartics. The preparations of Mercury which encrease all the secretions, are particularly valuable from stimulating the intestinal glands and the secretion of bile from the liver. The influence of Cathartics as therapeutical agents is most extensive, first, from the great extent of surface upon which they act, covered as this surface is with secreting organs; secondly, from the certainty, as well as from the rapidity, with which most of them act. A part of their influence, at least of some of them, as of Aloes, is from proximity propagated to the uterus. Many of them, especially the Saline Cathartics, act also as Diuretics, but here quantity seems to influence the mode of action, large doses acting as purgatives, small ones as diuretics, especially when much diluted. But during the action of brisk Cathartics, the quantity of urine is generally diminished, and the salts of the vegetable acids are not so readily converted, if at all, into carbonates. As the copious watery evacuations must diminish the quantity of fluid in the body, they necessarily diminish excitement, at the same time that they favour absorption, and therefore they may, for the first reason, be employed as powerful agents in antiphlogistic treatment, and, for the second, in cases of dropsy. As they are various in nature, so there is ample field for selection. For cases of irritation in the intestinal canal, the mild acting oils or neutral salts may be employed, or in cases of acidity with diarrhœa, the antacid Magnesia or its carbonate with the subsequently astringent Rhubarb. So in cases of fever or of inflammation, though we may choose the fully effective, we have to avoid the irritant; while in other cases, when we would rouse the system, or make the action on the bowels to act as a derivative from other parts, we equally select

such as are effective, but prefer Calomel and the resinous purgatives, because they are slower and more continuous in their action. Hence, from the necessity of relieving the system, or facilitating the performance of other functions, or from the necessity of getting rid of effete matters, there are few complaints in which purgatives are not useful if not essential.

Laxatives from the Mineral Kingdom. Sulphur sublimatum et lotum. Magnesia. Magn. Carb.

Saline Purgatives. Magnesiæ Sulphas. et purum, D., made by adding Sul' to Carb. of Magnesia. Potassæ Sulph. Bisulph.: this may be given in effervescence with Carb. Soda.

Potassæ Tartras. et Bitartras. The latter in Pulv. Jalapæ comp. Acetas Potassæ, seldom used as a purgative.

Potassæ Sulphas cum Sulphure.

Sodæ Sulphas. Sodæ Phosphas, Sodæ et Potassæ Tartras. Sodæ Acetas.

Sodii Chloridum. Pulv. Salinus comp. Sulphates of Potash and Magnesia with Common Salt: also Diuretic.

Mercurial Purgatives. Pil. Hydrarg. Hydrarg. c. Creta. Hyd. c. Magnesia. Hydr. Oxydum. The last in its action uncertain.

Hydrargyri Chloridum (Calomel).

Laxatives from the Vegetable Kingdom. Manna in Conf. and Syr. Sennæ. Cassiæ Pulpa et Conf., with Manna and Tamarinds in Conf. Sennæ. Tamarindus in Conf. Sennæ et Conf. Cassiæ, and Inf. Sennæ comp. Pruna in Elect. Sennæ. Uvæ passæ. Fici.

Viola odorata et Syr. Rosa centifolia et Syr.

Fixed Oils. Amygdalæ Ol. Olivæ Oil. Lini Oleum.

Purgatives. Ricini Oleum. Senna, Syr. Inf. comp. with Ginger, Inf. c. Tamarindis. Conf. with Pulp of Cassia and Tamarinds, Prunes, Figs, and Coriander. Tinct. comp. with Raisins, Caraway, and Coriander.

Rheum. Pil. Extr. Inf. Vinum. Pulv. comp. with Magnesia and Ginger. Pil. comp. with Aloes, Myrrh, and Caraway. Pil. Rhei et Ferri. Tinct. E. with Cardamoms. Tinct. comp. with Ginger and Saffron (Cardamoms, D.). Tinct. Rhei et Aloes, E. Tinct. Rhei et Gentianæ, E.

Colocynthis Extr. et Extr. comp. Spirituous Extract with Aloes, Scammony, and Cardamoms. Pil. comp. E. D. with Scammony, Sulphate of Potash, and Oil of Cloves. Enema.

Elaterium and Extr. of Elaterium. Tiglii *vel* Crotonis Oleum.

Jalapa. Tinct. et Resina Jalapæ. Pulv. comp. with Cream of Tartar and Ginger.

Scammonium. Resina. Mistura with Milk. Conf. with Cloves and Ginger. Pulv. comp. with Resin of Jalap, and Ginger.

Cambogia. Pil. comp. with Aloes and Ginger.

Aloes. Extr. Tinct. with Liquorice. Tinct. comp. with Saffron in Tinct. Myrrhæ. Pulv. c. Canella. Pulv. comp. with Guaiacum and Aromatics. Pil. comp. with Soap, Gentian Extr. and Caraway. Pil. Aloes c. Myrrha. et Pil. Aloes et Assafœtidæ. Pil. Aloes et Ferri. Dec. Aloes comp. with Myrrh, Saffron, Sulph. of Potash, and Tinct. of Cardamoms. Vinum Aloes with Canella, Cardamoms, Ginger.

Heliborus niger. Veratrum album. Colchicum.

Rhamnus et Syr. Linum catharticum, E. Little used. Euphorbium.

Terebinthinæ Oleum.

Enema Catharticum, E. D. Senna, Sulph. Magnesia and Olive Oil, E.

Manna and Sulph. Magnesia in comp. Dec. of Chamomile, D.

Cholagogues. Medicines considered to promote the secretion of bile. Nitro-muriatic acid. Mercurial preparations. Aloes. Rhubarb. Taraxacum.

ANTHELMINTICS. *Vermifuges.*

The word Anthelmintic is sometimes employed to indicate not only the medicines prescribed to prevent the production of worms, but also those which destroy or expel them, and the term Vermifuge applied to the latter only. As in other classes, we find very different medicines may be employed to produce the same effects, because worms may exist in different states of the constitution; therefore, whatever rectifies this, makes the intestinal canal less suitable to the residence of these parasites. As some of the medicines employed to irritate and dislodge worms from the intestinal canal act entirely as mechanical agents, that is, by irritating the worms, as they press their bodies against the sides of the intestinal canal, they might appropriately be treated of with the other groups of that division; but as the remedies so acting are few in number, for instance, Tin and Iron filings coarsely powdered, as well as Cowhage, while the remainder are either special in their mode of action, or owe their power to their action as Purgatives, it is preferable to treat of them after this class of remedies. Purgatives are frequently required to clear the intestinal canal. Tonics are necessary to give to the intestinal canal a healthy tone, but some are specifically injurious to the worms.

The worms commonly occurring in the intestinal canal in this ountry are the

Tænia solium, or common Tape-worm;

(Bothriocephalus latus, or Broad Tape-worm, occurs in Switzerland, &c.);

Trichocephalus dispar, or Trichurus, Long Thread-worm;

Oxyuris vermicularis, Maw-worm, or Ascarides, and

Ascaris lumbricoides, common or long Round-worm.—See *Steph. Med. Zool.*, Pl. 29.

Mechanical Anthelmintics. Stanni Pulvis. Ferri Limatura.

Mucuna pruriens. The strigose pubescence of Rottlera tinctoria is also used as an Anthelmintic in India. Gigartina Helminthochorton, from fine spiculæ of Corals, &c. intermixed with it.

Specific Anthelmintics. Granatum. Radicis Cortex. Dec. Filix Mas Pulv. and Ethereal Extract. Kosso or Brayera anthelmintica.

Andira et Geoffroyæ Dec. Spigelia Marylandica. Pulv. et Inf. with Senna, S. Anthelmia. Persicæ Folia.

Terebinthinæ Oleum. Rutæ Ol. Tanacetum. Absinthium. Santonicum.

Purgatives, &c. as Anthelmintics. Calomel. Gamboge. Jalap. Scammony.

Bitters generally injurious to worms, but useful also in giving tone.

Enemata against Ascarides. Sol. of Salts in Inf. Quassiæ. (*Paris*). Enema Aloes, L. (made with *Aloes* ℈ij., *Carb. Potash* gr. xv., *Barley water* Oß.

Injections of cold water or of Bitter Infusions, of Camphor in Oil.

EMMENAGOGA. *Emmenagogues.*

Medicines which are considered to have the power of promoting the menstrual discharge when either retained or suspended. As this is sometimes the primary, and at other times the consequence of some other disease, the treatment necessarily differs; especially as Amenorrhœa is as often dependent on a want of constitutional energy in a leucophlegmatic habit as on a plethoric state of the constitution, with irritation of the uterine system, brought on perhaps by an application of cold, &c. In either case attempts must first be made to restore the constitution to a natural state, and then to prescribe those remedies, all more or less stimulant, which are considered to have a specific effect as Emmenagogues, though it is doubtful whether there are any such, most seeming to act by contiguous sympathy. Dr. Paris has observed, "that as the uterus is not an organ intended for the elimination of foreign matter, it is necessarily less under the control of medicines."

In cases of plethora, Venæsection may be necessary, or Cupping on the Loins, with Leeches to the Loins or Groins, and Legs or Feet. Purgatives. Hip-baths. Hot Pediluvia of Water, or made more stimulating with Mustard-flour. Exercise, especially on horseback, in a salubrious air.

In cases of depression, Warm Purgatives are equally necessary, accompanied with the alterative action of Blue Pill; at first mild then stronger Tonics, followed by the preparations of Iron. Frictions on the Lumbar region. Electricity. Nourishing Diet. Exercise. Fresh air. Sea-bathing. Shower-baths. Alteratives often necessary, or Mercurials, as Pil. Hydrargyri, &c. and Pil. Hydrargyri Chloridi comp. (*Plummer's Pill*). Iodine, in form of Iodide of Potassium, or the Syrup of the Iodide of Iron.

Purgatives employed as Emmenagogues. Aloes. Pil. Aloes c. Myrrha, and the Dec. Aloes and Tinct. Aloes: with Assafœtida in Pil. Aloes et Assafœtidæ, E., with Iron, in Pil. Aloes et Ferri, E.

Colocynthis. Senna. Cambogia. Helleborus.

Fœtid Antispasmodics—as Assafœtida. Moschus. Castoreum.

Galbanum in Pil. Galbani comp. with Assafœtida, Sagapenum, and Myrrh.

Myrrha Tinct. Myrrh with Iron, in Pil. Ferri et Mistura Ferri, also in Pil. Galbani comp. and with Aloes. (*v.* supra).

Mineral Tonics. Ferri Sulphas. Pil. et Mist. Ferri comp. Ferri Carbonas cum Saccharo et Pil. Ferri Iodidum et Syrupus.

Emmenagogues. Rubia Tinctorum and Meum Athamanticum, now little used. Senega Inf. et Dec. Serpentaria, Inf. et Tinct. Rutæ Ol. et Confectio. Tanacetum.

Juniperus. Sabina et Oleum. Ergota, a stimulant of the motor nerves of the uterus, has been found useful by Dr. Locock, who also states the same of a combination of Myrrh, Aloes, Sulphate of Iron, and the Essential Oil of Savine.

RUBEFACIENTIA. *Irritants. Vesicants.*

Rubefacients, as their name indicates, produce redness of the skin, with warmth and increased sensibility, &c. If long applied, or more concentrated, vesication will ensue; and on continuance of the application, a suppurative discharge, whence Epispastic, from ἐπισπάω, *I draw.* Tartar Emetic produces a small pustular eruption. These

local effects sometimes react upon the constitution, so as to induce a state of general excitement, as in the case of Stimulants. The local external effect produced by the Rubefacient or Epispastic very frequently has the effect of relieving some internal irritation or deep-seated, even distant, pain; and therefore it is for their Counter-irritant or Revulsive effects that these remedies are applied: sometimes only to relieve slight internal inflammation, as Hartshorn and Oil on the neck to relieve sore throat, or a blister behind the ear to relieve toothache. Some, instead of merely exciting, act as irritants. But it is usually in chronic affections of the chest or of the abdominal cavity that they are most employed, or in spasmodic attacks of the limbs. Sometimes the head is relieved by hot pediluvia, or by Sinapisms to the feet. Issues, Setons, Acupuncture, are employed on the same general principles. Some act as local Stimulants and produce healthy granulations. Occasionally stimulant frictions and Sinapisms are applied in diseases accompanied by debility, to rouse the system in great depression of the vital powers.

Dr. Granville observes of this class of remedies, that many disorders which are considered difficult of cure, "may be speedily and successfully cured without having recourse to internal remedies.

"Even when diseasos are of a nature to require the use of internal remedies, strong ammoniated and spirituous preparations, holding Camphor and Volatile Oils in solution, externally used, will be found to be a most powerful auxiliary in hastening and securing the good effect of those remedies.

"That the principle on which all such external agents are supposed to act in the cure or alleviation of human maladies, has been termed *Counter-Irritation;* but that, in adopting such terms, many of the phenomena which accompany the use of ammoniated external applications are left unexplained."

Friction. Heat; in form of Hot water. Steam. Heated Sand and Metals, Hip and Foot-Baths.

Gases; as hot dry Air, Chlorine, Carbonic acid, and Sulphurous′ gases.

Acid Solutions, as of Nitric′, Acetic′, &c. Ung. Acidi Sulphurici. Acetic acid is used as an epispastic.

Alkaline Solutions, as of Ammonia, Potash, and their Carbonates. Liquor Ammoniæ fortior. Linim. Ammoniæ. Lin. Ammoniæ comp. Ammoniacal Ointment. Lin. Ammoniæ Sesquicarb.

Antimonii Potassio-Tartras; Sol. and Ung. Argenti Nitras, or in solution.

Local Stimulants. Ammoniæ Hydrochloras. Potassi Sulphuretum et Aqua. Sodii Chloridum. Borax. Mel Boracis.

Ung. Hydrarg. Nitratis et Hydr. Chloridi. Hydrargyri Nitrico-Oxydium et Ung. Hydrargyri Ammonio-Chloridum.

Vegetable Irritants employed as Rubefacients, Local Stimulants, and Epispastics.

Ranunculus acris. R. Flammula. Staphisagria. Delphinia, Tinct. and Ung. Cocculus indicus. Ung. Cocculi. Armoracia. Sinapis alba et nigra. Cataplasma Sinapis. Volatile Oil of Mustard. Pyrethrum. Capsicum. Tinct. Mezereon. Euphorbium. Sabina et Ceratum. Veratrum Dec. et Ung. Piper nigrum. Allium. Zingiber.

Volatile Oils (*v.* STIMULANTS) may be used as Rubefacients; also others less agreeable, as Oleum Rutæ, &c.

Turpentines, as Terebinthus Chia. T. vulgaris, Veneta, et Canadensis. Oleum et Linimentum.

Creasote, pure or diluted. Ung. Creasoti. Crotonis Oleum. Toxicodendron.

Resins, as Resina. Abietis Resina et Pix Burgundica. Emp. Picis. Elemi et Ung. comp. with Turpentine. Galbanum et Emp. Galbani comp. Pix liquida. Pix arida et Ung. Cerevisiæ Fermentum and Cataplasm.

Cantharides. Tinct. Acetum (epispast). Ceratum. Ung. Emp. et Emp. comp. Emplastrum Calefaciens.

2. *General Stimulants.*

General Stimulants have been distinguished from Local Stimulants, in not having their influence confined to one or two organs, but as exciting all the principal functions of life, as the sanguineous, muscular, and secreting systems, by directly influencing the nervous system, hence, by some, they are included under the head of Neurotica. Some are, however, more special, that is, affecting one set of nerves or particular functions of the mind or the senses more than others. The majority are temporary in their effects, and therefore require a repetition of the dose to keep up the impression. Tonics have been distinguished as more permanent in their effects, and as affecting the sanguineous and muscular, more than the nervous system.

TONICA. *Tonics.*

Tonics are medicines possessing the power of gradually increasing the tone of the muscular fibre when relaxed, and the vigour of the body when weakened by disease. Though resembling Astringents in some of their effects, they do not produce corrugation, unless when combined with Astringent principle, as is the case with some true Tonics. Acting like Excitants on the vital principle through the medium of the nervous system, they differ from them in the slowness with which they produce, as well as in the permanence of, their effects, and in their use not being followed by exhaustion or perceptible collapse. They are hence defined by Dr. Murray as "stimulants of considerable power, permanent in their operation." If carried to excess, or too long continued, they may act as Irritants or be productive of debility; for "if given when the powers of the system are at their maximum, Tonics will assume the characters of excitants, and their administration be followed by collapse." (*Paris.*) When a Tonic is fitly prescribed, as in a case of debility, its effects are gradually perceived; the energy of the stomach and the appetite are increased, digestion is facilitated, the force of the circulation augmented without corresponding quickness, and the respiration becomes fuller and more vigorous. In consequence of the more healthful performance of these functions, nutrition becomes necessarily more perfect. Absorption is performed with more vigour, as is first evident

in the constipation which usually follows the successful exhibition of Tonics, but is soon perceptible in other parts, so that the œdematous swellings of invalids disappear. Secretions become more natural, the urine more scanty and high-coloured; inordinate and partial sweats disappear, the skin returns to its normal state of softness, and the countenance resumes the natural glow of health. The senses and all the faculties become more active and the strength increased. Thus the patient labouring under diseases of real not apparent debility, or recovering from acute disease, or the effects of depressing and evacuating remedies, is restored to pristine health and energy.

Some of the Tonics, as Cinchona and its alkali Quinine, with the Arsenious acid, especially in the form of the Arsenical Solution, are prescribed as Antiperiodics, that is, as remedies to be taken in the intervals of paroxysmal diseases, so that Ague and Remittent Fever, or attacks of Neuralgia and even of Rheumatism, which observe some periodicity in their accession, are very frequently controlled by small doses of such medicines regularly repeated in the intervals of, or a larger one given immediately before, a paroxysmal attack. The most violent Remittent will often be affected by a few drops of Arsenical solution, if prescribed immediately after the acute symptoms have been controlled by other means, and anything like a remission is observed in the febrile attack.

Tonics are prescribed either in substance or in Infusion or Decoction, with the addition frequently of a Tincture of the same or of some other Tonic, or of one of the aromatic Stimulants. They require to be prescribed in moderate doses frequently repeated every two or three hours, sometimes changing the tonic. It is usually preferable to begin with the milder before proceeding to the more powerful metallic tonics, as the preparations of Iron. In some diseases, as Chlorosis and Anæmia, characterized by paleness, &c., this metal is particularly useful, as being an essential constituent of the red colouring matter, which in these diseases is deficient. It is also a constituent of some other tissues and fluids, and therefore in combining with them, acts in a great measure chemically.

Nutritious Diet. Cold. Exercise in the open air. Cold and Sea-Bathing.

Demulcent Tonics.—Cetraria et Dec. Ulmus et Dec. Pareira, Inf. et Extr. Calumba, Pulv. Inf. et Tinct: a mild tonic, thought also to be a little sedative; and being, like Quassia, without Tannin, may be prescribed with the salts of Iron.

Bitter Tonics.—Calumba. Quassia, Inf. et Tinct. Simaruba et Inf. Gentiana, Inf. Tinct. et Vinum comp. Chiretta, Inf. Centaurium. Menyanthes. Centaurea benedicta.

Nux Vomica, Extr.; a powerful Bitter and Stomachic.

Stimulant Tonics.—Drimys Winteri. Canella alba. Aurantii Cortex, Conf. Tinct. Syr. et Inf. comp. Limonum Cortex. Cusparia, Inf. et Tinct.

Ruta et Extr. Absinthium, Extr. Tanacetum. Archangelica. Marrubium. Cascarilla, Inf. et Tinct. Mist. comp with Squill. Lupulus, Inf. Tinct. et Ext. Acorus Calamus.

Antiperiodic and Astringent Tonics.—Cinchona Coronæ, cinerea, flava et rubra; Inf. Dec. Extr. et Tinct.; Tinct comp. with Orange-peel, Saffron, and Serpentaria. Quina and Quinæ Disulphas. Quinidine. Amorphous Quinine. Cinchonine and its Sulphate. Bebeerine. Salicis Cortex, Dec. Salicine. Narcotine. Piper nigrum? Uva Ursi. Chimaphila.

Mineral Antiperiodic.—Acid. Arseniosum. Liq. Potassæ Arsenitis.

Mineral Tonics.—Dil. Sul'. Dil. Nit'. Dil. Mur'.

Ferrum. Ferri Sesquioxydum. Emp. Ferri et Emp. Thuris. Ferrugo, E. (Hydrated Sesquioxide). Ferri Oxydum Nigrum, E. D. (a compound of Protoxide and Sesquioxide). Chalybeate Mineral Waters.

Tinct. Ferri Sesquichloridi. Tinct. Ferri Ammonio-Chloridi. Ferri Sulphas, et Pil. E. Liq. Oxysulphatis. Fer. Carbonas c. Saccharo. Pil. Fer. comp. with Carb. of Iron, Myrrh, and Sulph. Soda. Mistura Ferri with Myrrh, Nutmeg, and Sulph. Potash. Ferri et Quinæ Citras. Ferri Valerianas.

Ferri et Potassæ Tartras. Vinum Ferri. Ferri Citr. et Ammonio-Citras. *Aqua Chalybeata. Ferri Acetas,* D. *Lactate and Malate.*

With Iodine, &c. Ferri Iodidum et Syr. With Aromatics, Ferri Mist. Arom. Pil. Rhei et Ferri; Pil. Aloes et Ferri.

Zinci Oxyd. et Sulph. Cupri Sulphas et Ammonio-Sulph. Bismuthi Trisnitras.

STIMULANTIA. *Excitants. Exhilarants.*

Stimulants, or Excitants, as they are also called, are distinguished as medicines from exciting nervous power. Those which are usually included under this term, accelerate, by directly influencing the nervous centres, all the other principal functions of life, that is the sanguineous, muscular and secreting systems. Having been absorbed into the circulation, they are brought into contact with nervous matter, and some, no doubt, afterwards eliminated. Some, more than others, excite the functions of the brain, quicken sensibility, exhilarate the spirits and clear the mental faculties. Of these, some, which are also the most powerful, are sometimes placed among narcotics; because, when taken in sufficient quantities, inordinate excitement ensues, which is followed by collapse and a comatose state, closely resembling the effects of true narcotics. But as they are not employed for such purposes in medicine, it is preferable to attach them to this group, but distinguishing them by the title of Diffusible Stimulants. Other Stimulants, though exciting nervous action, do so only in a limited way, that is, affect only particular nerves, and are, therefore, separated from the others as Special Excitants or Stimulants. Again, whatever removes an impediment to the due performance of the natural functions, will sometimes appear to have a Stimulant effect.

Stimulants, in addition to ammonia, consist of volatile oils, resins or acrid principles, and of drugs which contain them. As stated under the head of Rubefacients, when applied externally, they produce redness, a sensation of warmth quickly communicated to surrounding parts, often followed by pain, according to the more or less susceptibility of the organ. If taken internally, the sensation of warmth is experienced in the stomach and intestinal canal, followed by a marked increase in the vital energy and contractility, with activity of diges-

tion, often accompanied by thirst and dryness of the mouth. In large doses, those which are more acrid will prove irritant. These effects are very temporary with many Stimulants; with others, they are quickly communicated to the heart and circulation, which is increased in force and frequency; more animal heat is developed, and transpiration promoted both from the cutaneous and pulmonary surfaces, as well as many of the secretions augmented. With some of the Stimulants the organs of generation participate in the general excitement. In all these cases it is the nervous or true cerebro-spinal system which is primarily affected, and through it, by reflex action, all the cerebro-spinous organs. Dr. Pereira conceived that the action of most was confined to the sympathetic system of nerves, hence he included them among his Ganglionics. "But the nervous energy becomes more equable and rapid; the muscular contractility more energetic; the senses more delicate and perfect, and the intellectual faculties even seem to acquire more activity and development." (*Guersent.*) Action, however, is not always power, and all excitement is followed by exhaustion; and though the collapse is proportionally much greater, and also different, with Narcotics, it may be produced to as great an extent by the use of a large quantity of a Diffusible Stimulant; but in such a case it ceases to be employed as a Stimulant only.

Stimulants are useful in cases of debility, where this is real, and unaccompanied by inflammation, and not merely apparent, whether the debility be the consequence of profuse Hæmorrhage or of other inordinate discharges, or a consequence of Asphyxia, or of Syncope; in great general debility, or in Anæmia and Cachexia without any local inflammation, or in the last stages of many grave diseases, when the powers flag and life appears about to be extinguished. They remedy the want of nervous force, and, where this is temporary, serve to restore vital power, and give time for the restoration of other functions. Their use, however, requires the greatest caution and discrimination. Though they may be prescribed beneficially in languor, relaxation, and debility, and in some cases even of chronic Inflammation, as is done with stimulant lotions to the eye in a state both of incipient and of chronic Inflammation; their employment is usually limited to prescribing them in conjunction with other classes of remedies.

Heat. Electricity. The Vital Stimuli, as Heat, Air, Food, Drink, will all act as Stimulants in cases of Debility, or where the patient has been deprived of their use. When used in moderation, these are not followed by exhaustion.

Ordinary Excitants—as Tea. Green Tea. Coffee. Paraguay Tea.

Ammoniæ Liq. Sp. Ammoniæ et Sp. Ammoniæ arom. Ammoniæ Sesquicarb. et Liquor. Phosphorus. Oxygen.

Aromata or Spices, grateful in odour and taste, are hence used as Condiments. They stimulate the stomach; are useful as Carminatives, and as Adjuncts to remedies of different kinds, as Tonics, Antispasmodics, and Cathartics.

Of *Myrtaceæ.* Caryophyllus, Oleum. et Inf. Pimenta, Ol. Spir. et Aqua.

Cayaputi Ol. Of *Laurineæ.* Cinnamomum. Ol. Spir. Tinct. Aq. et Tinct. comp. Pulv. comp. et Electuar. with other Aromatics. Confectio Aromat. with Chalk also. Cassia, E., Ol. Sp. Tinct. et Aqua. Laurus nobilis. Folia. Sassafras. Ol. Of *Myristiceæ,* Myristica. Ol. et Spir. Of *Piperaceæ,* Piper nigrum. Conf. et Ung. P. longum in Conf. Opii, and with other aromatics. Of *Scitamineæ,* Curcuma. Cardamomum. Tinct. et Tinct. comp. Zingiber, Tinct. et Syr. Of *Irideæ,* Crocus.—Canella alba.

Capsicum. Tinct. Sinapis nigra et alba.

Others valuable chiefly on account of their *Volatile Oil,* as Ol. Calami Aromat. (Spikenard). Of *Auranticeæ,* Limonis Ol. et Aurantii Ol. Of *Umbelliferæ,* Anisum. Carui Ol. Sp. et Aqua. Fœniculum dulce. Ol. et Aqua. Anethum. Ol. et Aq. Cuminum. Coriandrum. Of *Labiatæ.* Melissa. Mentha viridis. Piperita, and Pulegium. Ol. Sp. et Aq. Lavandula, Ol. Sp. et Tinct. comp. Rosmarinus, Ol. et Sp. Origanum vulgare et Majorana et Ol.

Others less agreeable, as Ol. Rutæ et Conf. Ol. Anthemidis et Tanaceti. Oleum Juniperi, et Sabinæ.

Turpentines—as Terebinthina Chia, vulgaris, &c. Oleum Terebinthinæ.

Resins—as Elemi. Mastiche. Olibanum. Myrrha, and Balsam of Peru, &c.

Petroleum. Naphtha. Creasotum et Mist.

See also STIMULANT TONICS, DIAPHORETICS, EXPECTORANTS, AND DIURETICS.

DIFFUSIBLE STIMULANTS. — These, which include Alcohol and Ether, are usually distinguished from other Stimulants by the rapidity with which they excite the whole system through the medium of the brain and nerves. These effects, in moderate doses, are exhilarant, and soon pass off, in larger they produce intoxication, which is followed by exhaustion and collapse, and the comatose state characteristic of drunkenness. Though Opium and the several preparations of Hemp are used in all Eastern countries as Excitants, they are so soon followed by symptoms of collapse, that it will be preferable to arrange them, as well as others, under one of the sections of Narcotics. Ether, though at first excitant, is afterwards so soothing as to be prescribed in nervous affections and frequently with opiates. When inhaled it produces insensibility to pain like Chloroform.

Spiritus Vini Gallici et Mistura. Spir. rectificatus et tenuior. Vinum. Xericum and other wines.

Æther. *Æ. Sulph.* Spir. Ætheris comp. Spir. Æther. Nitrici. Chloroform.

SPECIAL EXCITANTS are distinguished by being local in their action, and exciting only particular nerves, as Strychnia does those of the spinal cord, especially the motor branches, and thus causes a contraction of muscles.

Special Excitants.—Nux Vomica. Tinct. et Extr. Strychnia. Brucia. Toxicodendron. Arnica montana. Ergot of Rye.

3. *Depressents or Contra-Stimulants.*

The author has grouped together the Narcotics, Antispasmodics, Refrigerants, and Sedatives, not that they can be considered as resembling each other physiologically in action (though the Sedatives are often united with Narcotics), but because all are employed to subdue inordinate action, the Refrigerants and Sedatives when occurring in the circulation, Narcotics to assuage pain, control restlessness,

and to procure sleep, while Antispasmodics have a quieting effect on the disordered nervous system.

NARCOTICA. *Hypnotica.* *Anodyne.*

Narcotics are so named from *ναρκη*, the torpedo, which stupefies any other animal which it touches, because stupefaction is the most striking symptom of some, though not of all the medicines which are usually included under the head of Narcotics. The name, therefore, being objectionable, Dr. Pereira suggested that of Cerebro-Spinals, as including all those which affect either the brain or spinal marrow, and their respective nerves. But the great peculiarity of this group of medicines is that hardly two of them resemble each other exactly in their mode of action, and, therefore, no one name will apply equally well to all; it is better to divide them into smaller groups, to which distinctive appellations may be given. Stimulants produce excitement, and the Diffusible Stimulants considerable excitement followed by corresponding depression. Opium, the type of Narcotics, slightly accelerates the pulse, stimulates some of the functions, exhilarates the spirits, but its use is soon followed by drowsiness and sleep. Narcotics are distinguished from true Sedatives by producing, when prescribed in moderate doses, "an increase of the actions of the nervous and vascular systems, but which is followed by a greater depression of the vital powers than is commensurate with the degree of previous excitement, and which is generally followed by sleep."—*Paris.* They entirely overcome volition and sensation as well as the special senses. From the varied effects which the remedies usually classed under this head produce, some, as Opium, are called Soporifics and Hypnotics, from causing sleep; others, of which again opium is the most conspicuous, are called Anodynes, from allaying pain; but of these, some, as Belladonna and Stramonium, induce sleep only from relieving pain, and are remarkable for dilating the pupil, and producing a kind of mirthful delirium and wandering of the mind. Aconite, and its alkali Aconitina, produce numbness in the sentient nerves, over which they are applied, and act as general sedatives, with which they should be arranged, as well as a fourth group, which includes Hemlock and its alkali Conia, as these produce paralysis of the muscles, from acting on the motor nerves. Hemp and its various preparations, at first exciting, are followed by sleep, stupefaction, relaxation of the muscles, and also, occasionally, by a state resembling catalepsy; while another group, now commonly called Anæsthetics, are conspicuous for diminishing or entirely removing the sensibility to pain. The drugs called Acro-narcotics, have the power of allaying pain, besides acting as irritants in the intestinal canal; they also produce nausea and great depression, and might therefore form a group of Sedatives. Opium, however, the type of Narcotics, is itself capable of effecting most of the objects required. Though excitant in the first instance, its

use is soon followed by diminished sensibility and sleep. Violent pains are relieved, powerful spasms subdued, and inordinate secretions, with the exception of that of the skin, restrained,—*v.* p. 215.

Narcotics are had recourse to chiefly to assuage pain and to procure sleep; hence they may be useful in a great variety of affections, chiefly in the treatment of nervous and spasmodic complaints, painful diseases, as Neuralgia, Rheumatism, &c., and in the last stages of other painful complaints.

Papaver somniferum. Capsulæ. Dec. Syrupus et Extractum.

Opium. Extr. Pil. et Trochisci. Opii Conf. vel. Elect. Tinct. (Laudanum). Vinum. Acetum. Liq. Opii sedativus and Black Drop. Enema, Lin. et Emp.

Pills with Opium. Pil. Saponis comp. et Pil. Styracis comp. Pil. Calomelanos et Opii. Pil. Plumbi Opiatæ.

Tinct. Camphoræ comp. with Opium, Camphor, and Benzoic'. Tinct. Opii Ammoniata, E, with Sp. Ammon. E.

Opium with Ipecacuanha.—Pil. et Pulv. Ipecacuanhæ comp.

Opium with Astringents.—Pulv. Kino comp. Elect. Catechu, E. Pulv. Cretæ comp. c. Opio. Ung. Gallæ comp.

Morphiæ Hydrochloras (Murias, E). Muriatis Sol. Trochisci Morphiæ. Troch. Morphiæ et Ipecac.

Morphiæ Sulphas. Morphiæ Acetas. Citrate and Bimeconate.

Lactuca sativa. et virosa. Lactucarium. Extr. Tinct. et Trochisci.

Humulus Lupulus. The Tincture and Tincture of Hop-Glands.

Anodynes, which cause delirium and dilate the pupils. — Hyoscyamus niger. Extr. et Tinct. Belladonna, Extr. Succus. Tinct. et Emp. Stramonium. Extr.

Acro-Narcotics and Cathartics.—Staphisagria. Colchicum. Veratrum. Sabadilla.

Nux Vomica, Toxicodendron, and Arnica: *see* EXCITANTS, special.

ANTISPASMODICA. *Antispasmodics.*

Antispasmodics are medicines prescribed for the purpose of allaying the irregular muscular contractions denominated Spasms. As these may arise from various causes, so whatever removes the cause will in many cases assuage the spasm and the pain which accompanies it. This may at one time be an Antacid or a Purgative which removes a source of irritation from the intestinal canal; at another time, an Anodyne, which, by lulling pain, stops the irregular movements to which this gives origin; and if these should depend on debility, then strengthening diet and Tonics will prove Antispasmodic. The name is however usually applied to a group so peculiar in their action, as to be accounted excitant by some and sedative by others, and therefore hardly require to be treated of separately. Though exciting the circulation, they have a sedative effect upon the nervous system in disease, apparently by stimulating and thus restoring it to a healthy state. They are remarkable for rapidity of action, as well as for their effects being temporary, and thus requiring a repetition and even increased doses of the medicine. They are chiefly prescribed in nervous complaints, especially Hysteria, and in Spasmodic and Convulsive

affections; also in Asthma, Spasm in the stomach or intestinal canal; sometimes in the advanced stages of Typhoid disease.

Valeriana, Inf. Tinct., and Tinct. Ammoniata.
Fœtid Gum-Resins. Assafœtida. Mist. Tinct. et Enem. Emp. E. with Galbanum. Galbanum Tinct. et Pil. comp. with Myrrh, Assafœtida, and Sagapenum. Emp. with Resin and Turpentine. Sagapenum. Pil. comp. with Aloes and Ginger. Opopanax.
Ruta. Ol. et Conf. comp. with Bay-berries, Sagapenum, and Black Pepper. Tanacetum. Anthemis et Ol.
Camphora. Mist. et Mist. c. Magnesia. Tinct. et Tinct. comp. with Opium. Linim. with Oil, and Lin Comp. with Ammonia and Spirit and Oil of Lavender.
Æther Sulph. Sp. Ætheris Sulph. comp. Sp. Ætheris Nitrici.
Sp. Ammoniæ arom. Sp. Ammoniæ fœtidus. Ammoniæ Sesquicarb. Petroleum. Naphtha. Succini Ol.
Moschus. Mist. et Tinct. Castoreum. Tinct. et Tinct. Ammon.
Narcotics and Sedatives.—Opium. Belladonna. Stramonium. Hyoscyamus. Tabacum, Enema et Vinum. Lobelia. Tinct. et Tinctura Ætherea. Cannabis indica. Conium and its alkali Conia.
Tonics.—Argenti Oxydum, Chloridum et Nitras. Zinci Oxydum et Sulphas. Cupri Ammonio-Sulph. et Pil. Bismuthi Trinsitras. Cinchona, Quinine and other Tonics.

Refrigerantia. *Refrigerants.*

Refrigerants have been defined to be "such medicines as diminish the force of the circulation, and reduce the heat of the body, without occasioning any diminution of sensibility or nervous energy." Dr. Murray, alluding to the source of animal temperature, refers to the fact that the consumption of oxygen in the lungs and the temperature of the body are increased when the aliment received into the stomach is composed of substances, such as animal food and spirits, which contain a small proportion of oxygen. But when the temperature of the body is morbidly increased, if we introduce into the stomach substances containing a large proportion of oxygen, such, for instance, as the vegetable acids, we may succeed in reducing the morbid heat. The nutritious matter conveyed to the blood, containing thus a larger proportion of oxygen than usual, will be disposed to abstract less of it from the air in the lungs, and, consequently, less caloric will be evolved there. Dr. Murray's views have long been admired for their ingenuity, but modern discoveries would seem to prove that they are probably also correct. Dr. Blake, however, in his experiments on injecting different substances into the blood, found that all acids produced an impediment to the passage of the blood through the pulmonary capillaries.

But some Refrigerants, though powerful in effect, certainly act in a different way; thus, cold in the form of Ice, or of freezing mixtures, is the most powerful of Sedatives in all kinds of excitement. Evaporating lotions, with alcohol or ether, certainly act in the first part according to physical laws, by abstracting caloric. Care must be taken not to cover up parts to which such lotions are applied, or the heating effects of the spirit or ether, will be experienced. Simple

sponging of the whole or a part of the body, with cold water, vinegar and water, or spirit and water, forms the most effective of Sedatives. The Author has, in some of the severest cases of Jungle Remittent, kept the patients constantly sponged day and night, so that the pulse was controlled and preternatural heat kept down, while the usual remedies were producing changes in the secretions and subduing the fever.

External Cool Air. Cold Water. Ice. Freezing Mixtures.
Continued Sponging with Vinegar or Spirit and Water. Evaporating Lotions.
Vegetable Acids, q.v. Trochisci Acidi Tartarici. Limonum Succus et Syr. Lemonade. Aurantii Fructus. Acetum. Syrupus Aceti. Tamarindus. Acetosella. Rumex Acetosa.
Potassæ Bitartras. Potassæ Nitras. Potassæ Chloras.
Mild Diaphoretics. Liq. Ammoniæ Acet. Effervescing Draughts.

SEDANTIA. *Sedativa. Contra-Stimulants.*

Sedatives, when strictly defined, are medicines which directly depress the energy of the nervous system, without causing any previous excitement. Though there are few medicines which can be rigorously brought under this definition, there are several which may be prescribed in diseases of increased action, whether of the nervous or sanguineous system. Considerable differences of opinion have been entertained respecting the mode of action of the remedies which have been called Sedatives, some denying that there are any which can strictly be so called, others uniting them with Narcotics and Diffusible Stimulants, which first exalt and then depress nervous power, and also affect the mind, producing stupefaction. Dr. Paris, Dr. A. T. Thomson, and others, admit Sedatives as a distinct class, in being distinguished from Narcotics by directly and primarily depressing the powers of life, without previously exciting either nervous force or the circulation. Though all which are now included under this head may not come strictly under this definition, they may yet be used to control inordinate action. However much writers may differ respecting the proper position of Sedatives in a classification, practitioners know that there are medicines which may be prescribed beneficially in cases of excitement, when they would reject the more powerful narcotics, and should avoid uniting them in a prescription. Though agreeing in the general effects which they produce, and generally in not affecting the mind or its functions, they differ in their mode of action.

Hydrocyanic' useful in allaying irritation and cough, and giving great relief in certain painful affections of the stomach, possesses a general anodyne and sedative effect, yet, in large doses, produces convulsions and syncope, and, in still larger, death without convulsion. Aconite, producing tingling without redness, quickly followed by numbness of the part to which it is applied, is particularly valuable in allaying the pain of severe neuralgic affections: when given internally, it dimi-

nishes the circulation, and acts as a powerful sedative. Hemlock and its alkali Conia have, in recent times, been ascertained to differ much from the narcotics with which Conium was usually classed, producing, to use Dr. Christison's words, "swiftly spreading paralysis of the motor nerves, exhausting the nervous energy of the motor nerves of the spinal cord, producing general paralysis and asphyxia from relaxation." Thus affording the appropriate remedy for tetanus and the effects of Strychnia, whose special stimulant action on the spinal cord, produces permanent spasm of the muscles. The senses do not seem to be affected so long as respiration goes on. It has been supposed to extinguish sensation, because, by inducing paralysis, it takes away the power of expression. Conium, with its sedative, is supposed to unite deobstruent powers.

Digitalis again first excites but soon depresses the heart, and greatly lowers the circulation, acting slightly on the intestinal canal and efficiently as a Diuretic. Colchicum, Tobacco, and Lobelia, at first excitant, produce great nausea, depression, and relaxation of the muscles, and are hence employed to produce relaxation in spasmodic affections, and in the reduction of Dislocations. Of the Acro-Narcotics, Colchicum may also be placed here as acting on the liver and intestinal canal; it produces copious evacuations, extreme depression, and affords great relief from the pain of Rheumatism and of Gout. The latter effect may be experienced in slight cases, without the former. But the most usefully powerful methods which we have for producing depression are Ipecacuanha and the Antimonial preparations, which are also useful as Diaphoretics, Expectorants, and Emetics, and which in suitable doses produce extreme nausea, the greatest depression, and consequently powerful sedative effects. Hence Tartar-emetic is one of the most effective agents in contra-stimulant treatment; it is, moreover, the agent which has been most frequently employed when it has been required to encrease the dose of the contra-stimulant in proportion to the degree of excitement. Thus was ascertained the capability of the body of bearing much larger doses of Tartar Emetic than was previously thought possible, and which has been named *tolerance* of medicines. Thus adding another to the different modes in which medicines seem to act and to produce their effects, and also encreasing the difficulty of making a good Physiological or Therapeutical arrangement of the Materia Medica.

Nitrogen, Sulphuretted Hydrogen and Carbonic Acid Gas, act as Sedatives when inhaled, but all are poisonous.

Acidum Hydrocyanicum Dil. Lauro-Cerasus et Aqua. Amygdalæ Amaræ. Oil of Bitter Almonds. Cyanides of Potassium and of Zinc.

Ferrocyanide of Potassium. Ferri Percyanidum.

Benumbent and Sedative. Aconitum Napellus. Extr. et Succus spissatus, L. D. Extr. E. Extr. Alcoholicum Aconiti et Tinct. Aconitina. Solutio et Unguentum. Liquor et Lotio. *v.* p. 292.

Paralysers.—Conium maculatum. Extr. (Succus spissatus), Tinct. Pil. comp. with Ipecac. Ung. et Cataplasm.

Anticonvulsive and Anodyne.—Cannabis sativa. Extr. et Tinct. Resinous Tincture *(Donovan).*

Digitalis. Infusum. Tinctura et Extract. Liniment with Soap and Ammonia. Pilulæ Digitalis et Scillæ.

Tabacum. Enema et Vinum, or the Smoke. Lobella inflata.

Antimonii et Potassæ Tartras. Vinum. Ipecacuanha. Pulvis et Vinum, given in nauseating doses.

Plumbi Acetas et Pil. Opiatæ. Plumbi Diacetatis Liquor et Dilutus.

Antiphlogistic Treatment generally, which includes Blood-letting, Leeches, Purgatives, Refrigerants, the application of Cold, continued Sponging, Demulcents.

Anæsthetics. Ether and Chloroformyl, or Chloroform inhaled.

Hydrocyanic′ and Creasote give great relief from pain in the Stomach in Gastrodynia. So the Nitrate of Bismuth. Calomel in gr. x. and gr. xx. doses, gives great relief, and acts like a Sedative in cases of acute Dysentery.

Various circumstances modify the action of Medicines, and therefore they cannot always be prescribed in the same doses, even to the same individual; but besides this, the mode of preparation, age, sex, mode of life, climate, and peculiar idiosyncrasies, but especially age, —all modify the doses in which Medicines should be prescribed. The Table formed by Gaubius is of some use as a general guide for age.

GAUBIUS' TABLE,

Regulating the ordinary Proportion of Doses according to the Age of the Patient.

For an adult, suppose the dose to be	1	or	1 drachm,
Under 1 year will require	$\frac{1}{12}$	,,	5 grains.
,, 2 ,, ,, ,,	$\frac{1}{8}$	,,	8 ,,
,, 3 ,, ,, ,,	$\frac{1}{6}$	,,	10 ,,
,, 4 ,, ,, ,,	$\frac{1}{4}$	,,	15 ,,
,, 7 ,, ,, ,,	$\frac{1}{3}$	,,	1 scruple.
,, 14 ,, ,, ,,	$\frac{1}{2}$	,,	$\frac{1}{2}$ drachm.
,, 20 ,, ,, ,,	$\frac{2}{3}$	,,	2 scruples.
,, 21 to 60, the full dose, or	1	,,	1 drachm.

Above this age, an inverse gradation must be observed.

POISONS AND ANTIDOTES.

POISONS *as arranged by Dr. Christison, with the* ANTIDOTES, *&c. mentioned in the foregoing pages.*

In most cases the stomach requires to be quickly evacuated, either by emetics or by the stomach-pump; but with corrosive poisons this is not always safe. The suitable antidotes are to be prescribed, sometimes viscid substances to involve the poison. In many cases irritation is to be allayed, and inflammation subdued; but in others, moderate stimulants are necessary. With the poisonous gases, fresh air is essential, and cold affusion useful.

IRRITANT POISONS.

Acids.—Sulphuric, p. 36. Nitric, p. 44. Phosphorus and acid, p. 38.
Muriatic′ (p. 53) and Nitro-Muriatic acid. Tincture of Muriate of Iron.
Oxalic′, p. 363, Tartaric′, Citric′, and Acetic acid.

Alkalis.—Ammonia, p. 65. Potash (p. 78), its Carbonate (p. 85), Soda, &c., 101, so Lime. Nitre, 92. Alkaline Sulphurets, p. 60.

Solution of Chlorine, p. 51. Iodine (p. 46) and Iodide of Potassium, p. 160. Bromine and the Bromide of Potassium.

Baryta, salts of. Chloride of Barium (treated with Sulphates of Magnesia and Soda, also Carbonates. Stomach-pump or Emetics.)

Arsenic. Arsenious Acid. Liquor Potassæ Arsenitis. Sulphurets, p. 227; see Hydrated Sesquioxide of Iron, p. 142. Magnesia in a gelatinous state, or very light Magnesia, will remove about 1-25th of its weight of Arsenic from its solution in water. (*v.* P. J. vi. 137.))

Mercury, Bichloride, Bicyanide, and its irritant salts, p. 212. (Dr. Paris recommends Tartar Emetic as an Emetic in poisoning by Corrosive Sublimate.)

Copper, salts of, p. 169. (Hydrated Oxide of Iron has been recommended.)

Antimony, salts of, p. 195. Zinc, as for Antimony. Lead, salts of, p. 181, (with Milk and Albumen, Sulphate of Soda and Magnesia). Silver, Nitrate of, &c.—(Administer Common Salt and some of the Incompatibles at p. 234-5.)

Vegetable Acrids.—Euphorbium, p. 617: so Croton. Colocynth. Elaterium. Mezereon. Gamboge. Jalap. Savine.

Animal Acrids.—Cantharides.—(Evacuate Stomach. Demulcents. Allay irritation with Camphor, Dover's Powder, &c.)

NARCOTIC POISONS.

Opium and its preparations, p. 321. Henbane. Lactuca.
Hydrocyanic′, p. 442. Laurel-water. Oil of Bitter Almonds.

Poisonous Gases.—Chlorine, p. 50. Ammonia, p. 63. Hydrosulphuric′, p. 60. Carbonic acid. Carburretted Hydrogen. (With all, exposure to pure air, artificial respiration, and affusion of cold water.)

NARCOTIC ACRID POISONS.

Belladonna, p. 572: so Stramonium. Henbane. Tobacco.
Conium or Hemlock, p. 429; and poisonous Umbelliferæ.
Nux Vomica. Strychnia. (Remove poison from stomach.)
Aconite, p. 243: so Black and White Hellebore. Colchicum. Sabadilla.
Cocculus indicus. Digitalis, p. 567.
Alcohol. Ether.—(Evacuate stomach; cold affusion over head, and evaporating lotions; Leeches. Ammonia as a Stimulant.

TABLE OF MINERAL WATERS

ACCORDING TO THE ANALYSES OF BERGMANN, SCHWEITZER, AND OTHERS.

I. Carbonated Waters.

Sparkling. 100 cubic inches yield from 50 to 160 cubic inches of Carbonic Acid Gas. Exhilarating; refrigerant.

Ems, Carlsbad, Kissengen, Seltzer, Pyrmont, Spa.

II. Sulphuretted Waters.

Have a nauseous smell. Owe their properties to Sulphuretted Hydrogen Gas, of which 100 cubic inches contain from 5 to 20 cubic inches in a free state. Water frequently warm. Stimulant; diaphoretic; alterative.

Cheltenham and Harrowgate Sulphur Springs (England). Aix-la-Chapelle and Barèges (France). Nenndorf (Hesse).

III. Saline Waters.

Contain Carbonates, Sulphates, and Chlorides, of the Alkaline and Earthy bases. Solid constituents vary from 2 to 150 in 10,000 parts.

a. *Warm and feebly saline.* Diaphoretic.

Vichy, Baden-Baden, Bath, Bristol, Buxton, Matlock.

b. *Cold and bitter. Contain Sulph. Soda.* Purgative.

Carlsbad, Cheltenham, Leamington.

c. *Cold and bitter. Contain Sulph. Magnesia.* Purgative.

Epsom, Scarborough, Seidlitz.

d. *Cold and briny. Contain Chloride of Sodium.* Purgative.

Ashby-de-la-Zouch, Kreuznach, Pyrmont, Hamburg.

IV. Chalybeate Waters.

Owe their properties to Iron. Some deposit the Sesquioxide on exposure. These contain the Carbonate of Iron, held in solution by Carbonic Acid. Others contain the Iron chiefly in the condition of Sulphate. Contain from ·3 to 15 grains of Oxide of Iron in 10,000 parts. Tonic; restorative.

a. *Carbonated.*

Tunbridge, Brighton, Spa.

b. *Sulphated.*

Isle of Wight, Alexisbad, Passy.

INDEX.

LATIN AND ENGLISH.